Archaeological Impact Assessment

For the proposed Bosjesmansberg Solar Facility and associated power line options, located close to Copperton in the Northern Cape.

Prepared For

Savannah Environmental (Pty) Ltd

By

HERITAGE
Contracts and Archaeological Consulting

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I, Jaco van der Walt as duly authorised representative of Heritage Contracts and Archaeological Consulting CC, hereby confirm my independence as a specialist and declare that neither I nor the Heritage Contracts and Archaeological Consulting CC have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which the client was appointed as Environmental Assessment practitioner, other than fair remuneration for work performed on this project.

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EXECUTIVE SUMMARY

Savannah Environmental (Pty) Ltd, on behalf of Networx Renewables (Pty) Ltd, appointed Heritage Contracts and Archaeological Consulting CC (HCAC) to conduct an Archaeological Impact Assessment for a proposed solar energy facility (referred to as Bosjesmansberg) and power lines (three options considered) for connection into the national grid. The proposed 300 MW facility is to be constructed in 4 phases on portion 1 of the farm Bosjesmansberg approximately 14 km to the east of the town of Copperton within the Siyathemba Local Municipality in the Northern Cape Province.

The site is slightly undulating with several prominent quartzite ridges traversing the property roughly from north to south, other landscape features are two ephemeral pans in the north of the study area. Other studies in the area highlighted the archaeological importance of pans (Kiberd 2006, Wiltshire 2011, Orton 2012) and therefore the two pans located in phase 1 and 2 of the proposed project is flagged as **no-go** areas.

The vegetation is typical Bushmanland Arid Grassland and the farm is currently used for sheep and cattle farming. The area is characterised by large gravel areas, hard packed Aeolian sand on a calcrete layer to deep Aeolian sand.

Stone Age material is found widespread across the study area but is mostly of low heritage significance. Some sites however are of higher significance and some mitigation are recommended for these sites. The main characteristics of the 4 proposed development phases are that, where the Aeolian sand overlays the calcrete, artefact counts drastically drop, where in sections where deflation of the sand occurred Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA) material is found on the calcrete and gravel that is characteristic of the area.

Small numbers of isolated ESA tools were documented consisting of bifaces (handaxes) made from quartzite. These isolated finds are heavily weathered, rolled and patinated that may indicate their long exposure to the elements and corrosion and that they may not be in situ. The isolated finds will not further our understanding of the ESA of the area and no further action is necessary for this aspect

MSA artefacts consisted of large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes. Raw material was predominant in locally available quartzite. Localised MSA quarries exploiting quartz outcrops, quartzite ridges, bedrock and boulders were also found. This is a widespread occurrence with numerous quarries recorded in the area (Wiltshire 2011; van der Walt 2012).

LSA tools (scrapers, retouched and utilised flakes, blades and small round cores) were found in comparatively fewer concentrations compared to the MSA tallies. LSA tools are predominantly on CCS.

Compared to the rest of the study area a high frequency of MSA concentrations were recorded in Phase 1, probably attributed to the quartzite ridge in this area that was exploited as raw material. Similarly a high frequency of LSA mixed with a lower frequency of MSA artefacts were recorded in phase 4. Both these areas are marked as heritage sensitive areas and will require mitigation in order for the development to proceed in these areas.

No buildings exist on the site and no cultural landscape elements were noted. Visual impacts to scenic routes and sense of place are slightly higher due to the project's close proximity to the road but are still not assessed to be high from a heritage perspective but are assessed independently by a visual specialist as part of the EIA process.

If the recommendations as made in section 7 of this report are adhered to (subject to approval from SAHRA) there is, from an archaeological point of view, no reason why the development should not proceed.

General

Due to the subsurface nature of archaeological material and unmarked graves, the possibility of the occurrence of such finds cannot be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find/s.

Disclaimer: *Although all possible care is taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. Heritage Contracts and Archaeological Consulting CC and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.*

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ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BIA: Basic Impact Assessment
CRM: Cultural Resource Management
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Plan
ESA: Early Stone Age
GPS: Global Positioning System
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA: National Environmental Management Act
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)

Early Stone Age (~ 2.6 million to 250 000 years ago)

Middle Stone Age (~ 250 000 to 40-25 000 years ago)

Later Stone Age (~ 40-25 000, to recently, 100 years ago)

The Iron Age (~ AD 400 to 1840)

Historic (~ AD 1840 to 1950)

Historic building (over 60 years old)

1 BACKGROUND INFORMATION

Heritage Contracts and Archaeological Consulting CC (HCAC) was appointed to conduct an Archaeological Impact Assessment for the proposed commercial photovoltaic solar energy facility with a total export capacity of up to 300MW as well as associated infrastructure on a site located approximately 15 km east of Copperton in the Northern Cape Province. Three power line corridors were also assessed at a desktop level for connection to the national grid.

The aim of the study is to identify cultural heritage sites, document, and assess their importance within local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

The report outlines the approach and methodology utilized before and during the survey, which includes: Phase 1, a desktop study (van der Walt 2013) that includes collection from various sources and consultations; Phase 2, the physical surveying of the study area on foot and by vehicle; Phase 3, reporting the outcome of the study.

During the survey 6 heritage sites were identified as well as a number of find spots (34) consisting of low density scatters of mainly LSA and MSA material. General site conditions and features on sites were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report.

This report must also be submitted to the SAHRA for review.

1.1 Terms of Reference

Desktop study

Conduct a brief desktop study where information on the area is collected to provide a background setting of the archaeology that can be expected in the area.

Field study

Conduct a field study to: a) systematically survey the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.

Reporting

Report on the identification of anticipated and cumulative impacts the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with Heritage legislation and the code of ethics and guidelines of ASAPA.

To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

1.2. Archaeological Legislation and Best Practice

Phase 1, an AIA or a HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of a heritage specialist input is to:

- » Identify any heritage resources, which may be affected;
- » Assess the nature and degree of significance of such resources;
- » Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- » Assess the negative and positive impact of the development on these resources;
- » Make recommendations for the appropriate heritage management of these impacts.

The AIA or HIA, as a specialist sub-section of the EIA, is required under the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999), Section 23(2)(b) of the NEMA and section s.39(3)(b)(iii) of the MPRDA.

The AIA should be submitted, as part of the EIA, BIA or EMP, to the PHRA if established in the province or to SAHRA. SAHRA will be ultimately responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and additional development information, as per the EIA, BIA/EMP, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level).

Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 AIAs are primarily concerned with the location and identification of sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement.

After mitigation of a site, a destruction permit must be applied for from SAHRA by the client before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5]) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to SAHRA authorisation. If the grave is not situated inside a formal cemetery, but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws, set by the cemetery authority, must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning; or in some cases, the MEC for Housing and Welfare.

Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. To handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

1.3 Description of Study Area

1.3.1 Location Data

The proposed phased development will be located on portion 1 of the farm Bosjesmansberg 67 (Figure 1). The site is bordered by the 357 provincial road to the south and an Eskom power line traverses the site from east to west in the northern portion of the study area. There are various drainage lines draining the study area all flowing in a south westerly direction. Several landscape features like pans and quartzite ridges occur on site especially in the north eastern portion of the farm. The vegetation is predominantly Bushmanland Arid Grassland vegetation in the Nama-Karoo biome (Mucina & Rutherford 2006) which consists of Karoo scrub and grass and a few isolated *Acacia karoo* trees. Soils are mostly shallow on top of a calcrete layer with gravel distributed throughout the site (Figure 2-5) apart from some areas with fairly deep Aeolian sand cover.

1.3.2. Location Map

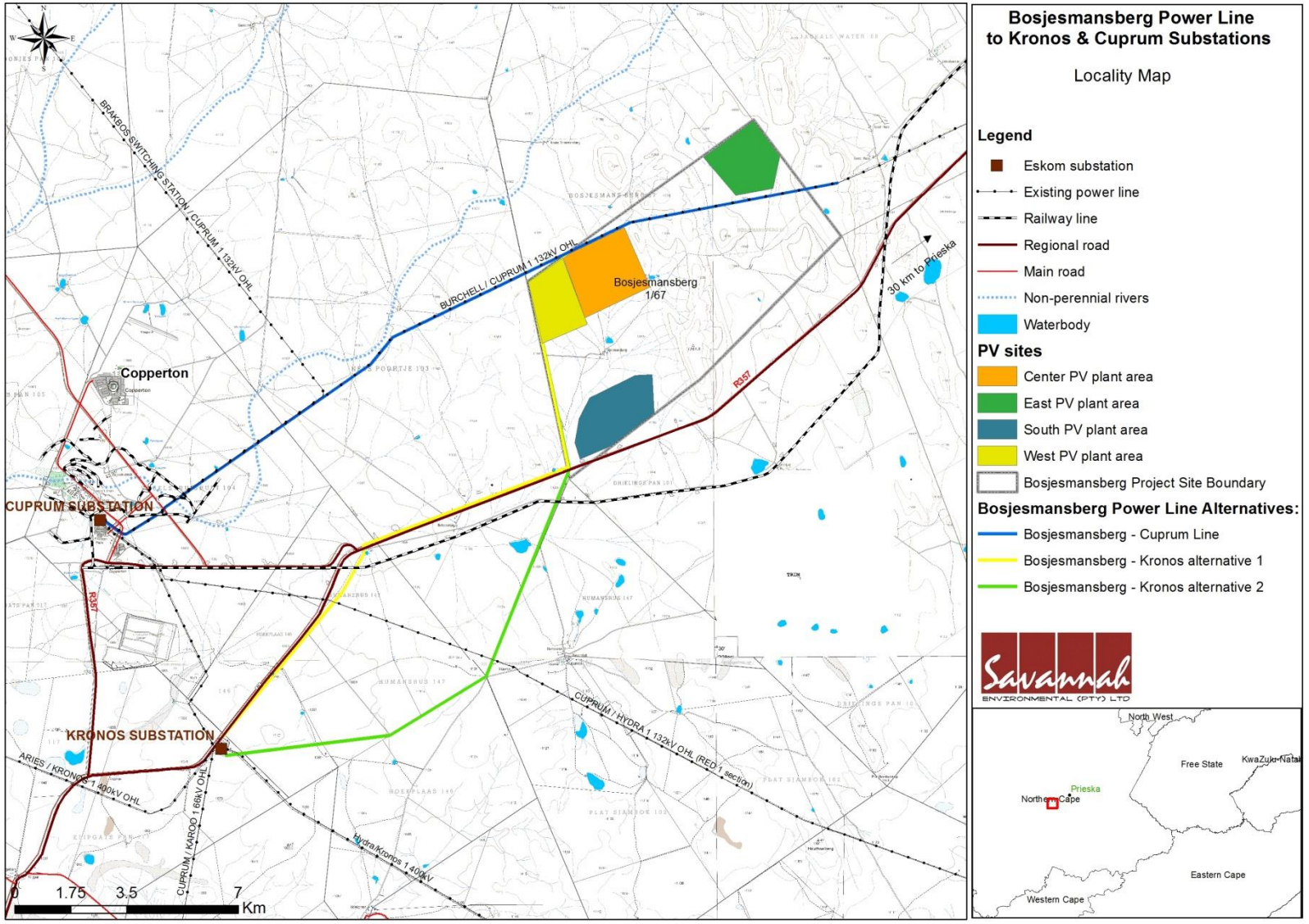

Figure 1: Location map showing the 4 proposed PV projects in relation to the power lines.

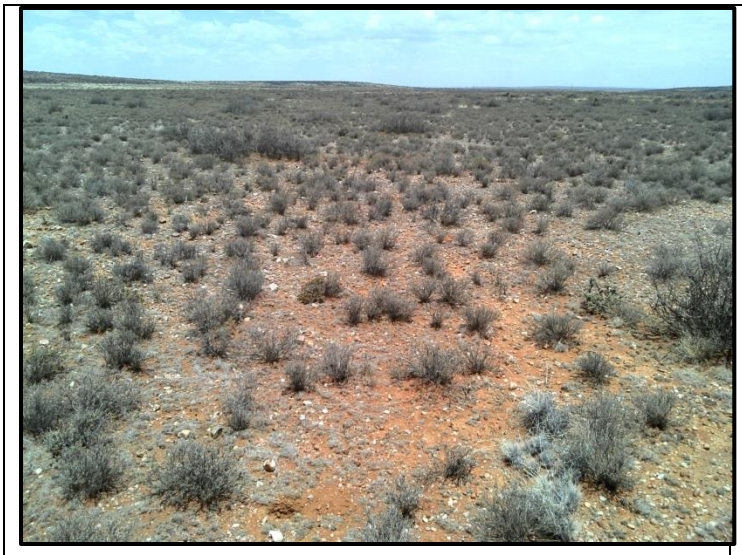

Figure 2. Site conditions in the central portion of Phase 1 note the shallow Aeolian sand.

Figure 3. Site conditions in the northern portion of Phase 2 note the gravel.

Figure 4. Hard packed Aeolian sand on calcrete in the western portion of Phase 1.

Figure 5. Calcrete and gravel that is found in large portions of all 4 phases.

2. APPROACH AND METHODOLOGY

The aim of the study is to cover archaeological databases to compile a background of the archaeology that can be expected in the study area followed by field verification; this was accomplished by means of the following phases.

2.1 Phase 1 - Desktop Study

The first phase comprised a scoping study, scanning existing records for archaeological sites, historical sites, graves, architecture (structures older than 60 years) of the area (van der Walt 2013). The following approached was followed for the compilation of the scoping report.

2.1.1 Literature Search
Utilising data for information gathering stored in the national archives and published reports relevant to the area. The aim of this is to extract data and information on the area in question.

2.1.2 Information Collection
SAHRIS was consulted to collect data from previously conducted CRM projects in the region to provide a comprehensive account of the history of the study area.

2.1.3 Consultation
No public consultation was done during the study as this was done as part of the EIA. The team did however consult with the farm owner Mr Gerhard van Wyk regarding graves or sites of archaeological and historical significance.

2.1.4 Google Earth and Mapping Survey
Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located.

2.1.5 Genealogical Society of South Africa
The database of the Genealogical Society was consulted to collect data on any known graves in the area.

2.2 Phase 2 - Physical Surveying
Due to the nature of cultural remains, the majority of which occurs below surface, a field survey of the study area over 4 days was conducted. The study area was surveyed by means of vehicle and extensive surveys on foot during the week of 24 – 27 November 2013. The survey was aimed at covering the proposed infrastructure, but also focused on specific areas on the landscape that would be more likely to contain archaeological and/or other heritage remains like drainage lines, rocky outcrops as well as slight elevations in the natural topography. These areas were searched more intensively, but many other areas were walked in order to confirm expectations in those areas. Track logs of the areas covered were taken (Figure 6).

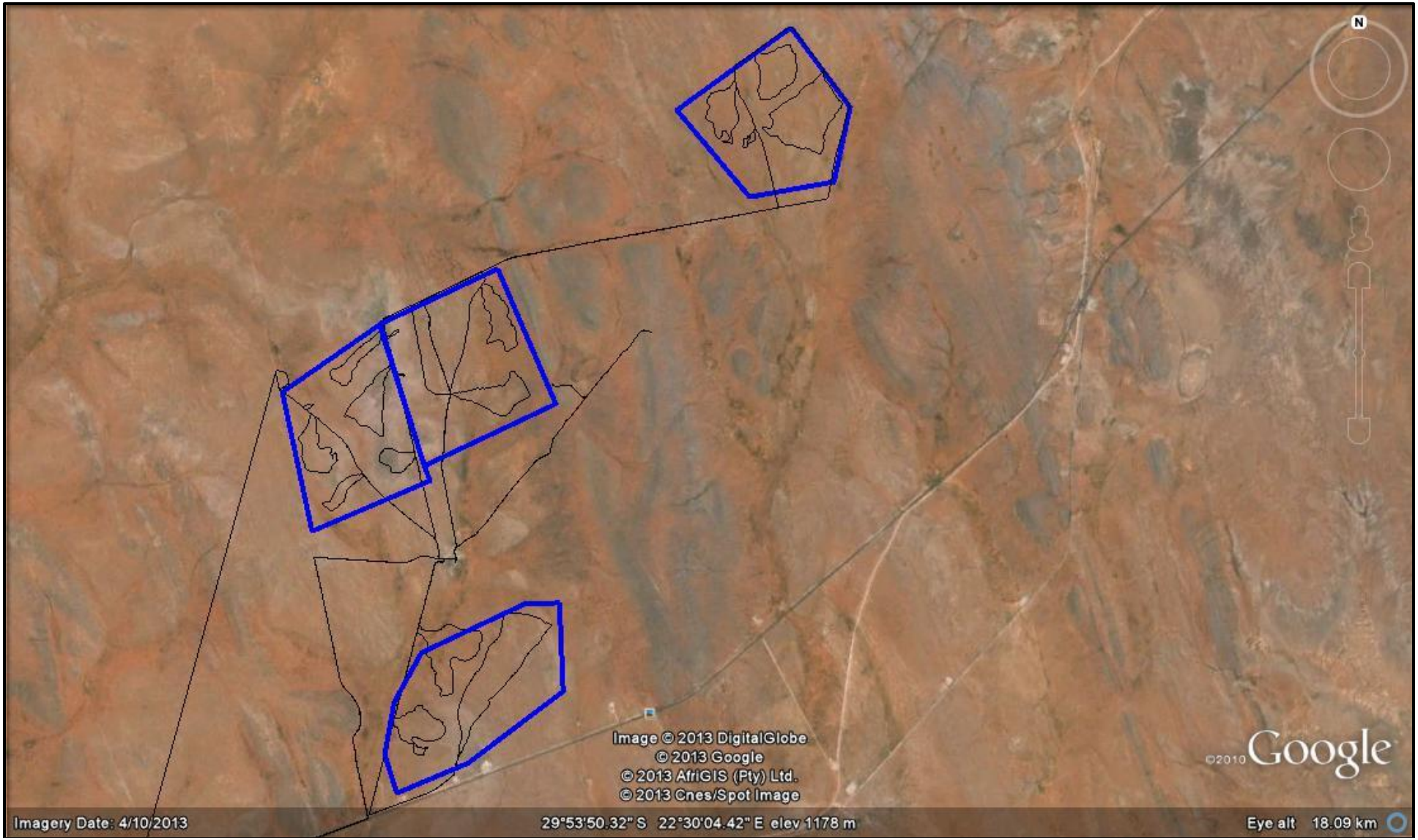

Figure 6. Track logs of the areas surveyed indicated in black.

All 4 phases of the proposed project was visited and physically walked. The section of the power line on Bosjesmansberg portion 1 was also physically surveyed, while portions of alternative 2 was surveyed previously Wiltshire (2011) Orton 2011, van der Walt (2012) the other alternatives was subjected to a desktop evaluation.

At the start of the survey a high density of Stone Age material was immediately noticed scattered in varying densities throughout the study area. Therefore low density scatters (between 4 - 5 artefacts per m²) was recorded as find spots. Scatters higher than 5 artefacts per m² were given site numbers and areas where quartzite and quartz outcrops were exploited were also recorded as sites. Scatters with densities less than 3 artefacts per m² were not recorded as they occur throughout the area. Individual occurrences were not point plotted within the recorded scatters however an attempt was made at determining site extent. GPS readings were taken roughly in the middle of each identified scatter.

2.3. Restrictions

Due to the fact that most cultural remains may occur below surface, the possibility exists that some features or artefacts may not have been discovered/ recorded during the survey. Low ground visibility of parts of the study area is due to sand cover and vegetation, and the possible occurrence of unmarked graves and other cultural material cannot be excluded. Only the footprint of the 4 phases was surveyed as indicated in the location map, and not the entire farm or the power line corridors. This was assessed at a desktop level.

In the north eastern portion of phase 2 and the north western portion of phase 4 archaeological visibility was at its lowest due to moderate to deep red Aeolian sands and low bushes. The Aeolian sands that covered most of the recorded sites also hampered an accurate estimation of site density and site extent. Depending on erosion and movement of the sand these counts can vary to a large degree when the site is revisited in future. It is assumed that information obtained for the wider region is accurate and applicable to this study. This report does not claim to have recorded every single artefact cluster due to the size of the area and the widespread occurrence of cultural material throughout. Sufficient information was recorded to establish the cultural sequence of the area and to mitigate the anticipated impacts resulting from the development.

Although HCAC surveyed the area as thoroughly as possible, it is incumbent upon the developer to stop operations and inform the relevant heritage agency should further cultural remains, such as stone tool scatters, artefacts, bones or fossils, be exposed during the process of development.

3. NATURE OF THE DEVELOPMENT

The solar energy facility is proposed to accommodate an array of photovoltaic (PV) panels with an export capacity of up to 300MW. It is proposed to make use of either static or tracking solar panel technology for this facility. Other infrastructure associated with the facility will include:

- Arrays of PV panels
- Appropriate mounting structures
- Cabling between the project components, to be lain underground where practical.
- An on-site substation and overhead power line to facilitate the connection between the solar energy facility and the Eskom grid via one of the following options:
  - A loop in/loop out of the Cuprum-Burchell 132kV power line which traverses the site;
  - Construction of an overhead distribution power line of approximately 15-20km in length to either Kronos Substation or to Cuprum Substation.
- Internal access roads and fencing.
- Workshop area for maintenance, storage, and offices.

4. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND OF THE STUDY AREA

A detailed scoping report was compiled for this project (van der Walt 2013). The scoping comprised a complete desktop study and below is a short summary of the findings.

4.1 Databases Consulted

SAHRA Report Mapping Project

Two previous heritage studies were conducted to the west of the study area (SAHRA report mapping project V1.0) by K van Ryneveld (2006 a,b,c). More recently J Orton (2012) conducted a study to the south west of the study area on the farm Hoekplaas and Wiltshire (2011) on portion 3 and 4 of the farm Nelspoortjie (now called Vogelstruisfontein). Recently a study (Ndlovu & Magoma 2013) was conducted on a very large area surrounding the current farm for Zinc prospecting but surprisingly found no Stone Age material. All the other studies recorded ESA, MSA and LSA artefacts scattered over the landscape with MSA and LSA sites centred around pans. Orton also recorded stone walled enclosures.

Genealogical Society and Google Earth Monuments

Neither the Genealogical Society nor the monuments database at Google Earth (Google Earth also include some archaeological sites and historical battlefields) have any recorded sites in the study area.

4.2. A Brief History of Human Settlement And Black And White Interaction In The Copperton Area

In order to understand the historical context of a certain area, it is necessary to consider the geographic and climatic nature of the region in question. The town of Copperton is located in a region in South Africa known as the Upper Karoo. One gets a good idea of what the natural landscape in the Upper Karoo was like between the late 1700s and early 1800s when one reads the transcripts of some of the early European travellers who passed through the area. One C. J. Skead compiled a book in which many of these texts are assembled. In November 1900, the traveller W. Somerville wrote about the Groot Riviers Poort, or Prieskapoort, 10km south of Prieska and therefore not very far from Copperton. He noted that grasslands and thorn trees covered the landscape, but that no tree was to be seen. When he neared the Orange River, he noted that the banks were covered with wood, but only along the margin of the river. These were mainly willow and karee trees. Along the tributary streams were thorn trees. (Skead 2009: 87)

Exactly one year later, One P. B. Borcherds wrote about the Grootrivierpoort at Prieska, making similar remarks about the flora as Somerville did. He also noted that the *poort* at the entrance to the Orange River was known by the "natives" under the name of t'Gariep. When this traveller passed along the banks of the Orange River near Prieska in the same year, he made notes on the Bushmen, who were still present in the area at that time. Regarding the manufacturing of bows and arrows by the Bushmen, he noted that the wood of the bow was of a type of tree commonly known as *caree boomen,* which was very tough and pliable. The arrows were made of a type of reed fairly common along all springs and river flowing there, known as *fluitjies riet*. The Bushmen apparently used the poison of venomous plants and poison extracted from the fangs of snakes to smear on their arrow points. These people also found sustenance in a type of small bulb, commonly called *mans uitjies* by the Khoikhoi, which were described to be the size of small marbles and not unpleasant in taste. (Skead 2009: 87-88)

In September 1822, W. J. Burchell passed through Prieska, as well as the area to the south and southwest thereof. Some 50km southwest of Prieska, he found a large muddy dam, which was situated in a very extensive hollow flat. This would become a lake in the rainy season. There was apparently still some clean water to be found. The area around this was hard and dry, and plentifully strewed with stones and low shrubs. Burchell passed through Prieska to the Orange River in the same month. He noted that none of the bushes exceeded a foot in height. Nearer to the Orange River, the travelling party found a group of Khoikhoi camped in a grove.

By 1903, Copperton was located in an area in which the annual rainfall measured between 10 and 20 inches, and was therefore quite arid. The farm area is located in a summer rainfall region. By the early 1900s, the Prieska district, in which Copperton would be located, could not be considered a very agriculturally active area. Only between 25 and 50 sheep were kept per square mile, and only between 2 and 5 heads of cattle. The area where Copperton was later founded would have been too dry and too far from the Orange River to allow for the growing of crops. (Burton 1903: 40; 256)

The farm Bosjemansberg 67 is located in close proximity of the small town of Copperton, and the history of this town is therefore of importance. On 16 November 1991, an article was published in *Die Burger* with regards to the town Copperton. It was asserted that the old deserted Northern Cape mining town would be developed and populated as a "Volkstaatsdorp" (city state / Volkstaat town) by the Oranje Development Corps. It was said that Copperton would then be the second Volkstaat town in South Africa that had been developed exclusively to be inhabited by whites. Earlier that year, Orania had been developed as such a town. Though the town of Copperton had been abandoned at the time, a business centre, primary school, nursery school, an office development and a drive-in theatre had been developed. About 50% of the town's streets were tarred. (Anon 1991: 2)

In November 1991, the Weekend Argus also published an article regarding the development of Copperton as an Orania-like town. It was noted that the 300 hectares mine area near the town would be used for industrial development, and that agriculture, as well as light industry such as steel, rubber and textile industries, were expected to be developed in the town. It could not be ascertained whether this town was eventually developed in this way. (Anon 1991: 5)

In an article in the Patriot, dated December 1995, some background information is given on the history of the town of Copperton. This town is not very old, as it was only developed in 1972 with the establishment of a copper mine in the area. The mine closed in 1992, and Copperton was sold to a private person, on the condition that the houses in the town would be demolished. About 300 houses were broken down, when it was decided that some homes would be kept in order to develop a retirement town. These houses were apparently solidly built, with stone walls and sink roofs. It was noted that the area was very sparsely populated, and that the farmers in the area farmed with sheep. Next to the Orange River, corn, maize and grapes were planted. It was noted that the closest hospitals were located at Prieska, some 35 to 40 minutes' drive from Copperton, and linked with a tarred road. (Anon 1995: 4)

4.3. Stone Age Background

4.3.1. Stone Age Background of the study area

Beaumont *et al.* (1995: 240) observed 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 ESA and MSA. Occasional LSA artefacts are also noted. What is noteworthy of the Northern Cape archaeological record is the presence of pans which frequently display associated archaeological material. Of interest here is the work of Kiberd (2001, 2005, 2006) who excavated Bundu Pan, some 25 to 30 km northwest of Copperton. The site yielded ESA, MSA and LSA horizons and the artefacts were accompanied by warthog and equid teeth to name a few (Beaumont *et al.* 1995).

Orton (2012) noted that to the northwest, west and southwest of Copperton sites have been investigated by Beaumont and colleagues (1995), Smith (1995a) and Parsons (2003, 2004, 2007, 2008) yielding LSA deposits. Work on these sites led to a distinction between hunter-gatherer and herder sites, based on stone artefact assemblages (Beaumont *et al.* 1995). All these Later Stone Age sites have very few, if any, organic items on them. The only organic material found on sites like these is fragments of ostrich eggshell probably belonging to broken water containers. Such flasks have been widely recorded across the Northern Cape (Morris 1994).

The archaeological importance of pans in the area are now well documented (Kiberd 2006, Wiltshire 2011, Orton 2012) and if any occur in the study area they could be of significance. Van der Walt (2012) recorded low densities of ESA, MSA and LSA scatters just west of the current study area and were given a field rating of low archaeological significance. However, several discrete MSA and LSA sites were also documented. Similar to the study by Orton (2012) a stone enclosure was also recorded as several sites with historic material during the 2012 study.

Most of the material expected for the study area is MSA in nature consisting of large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes. Raw material are expected to be predominantly in fine grained quartzite, hornfels, banded ironstone, chert and vein quartz based on the results of the 2012 study by the author of this report.

4.4. Palaeontology

Dr John Almond (2013) conducted a Palaeontological Impact Assessment for the study area and he concluded:

"The study area of the proposed Bosjesmansberg Solar Energy Facility near Copperton, Northern Cape, is underlain at depth by unfossiliferous Precambrian metasediments as well as by glacial sediments of the Dwyka Group that contain very few fossils (mainly reworked blocks of stromatolitic carbonate). The overlying superficial sediments (alluvium, gravels, aeolian sands, soils *etc*) are of low to very low palaeontological sensitivity. The impact significance of the solar facility development, *including* the various transmission line options, on local fossil heritage resources is considered to be VERY LOW".

Please refer to Annexure A for his full report

5. HERITAGE SITE SIGNIFICANCE AND MITIGATION MEASURES

The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project. In the case of the proposed quarry extension the local extent of its impact necessitates a representative sample and only the footprint of the areas demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface.

This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance:

- The unique nature of a site;
- The integrity of the archaeological/cultural heritage deposits;
- The wider historic, archaeological and geographic context of the site;
- The location of the site in relation to other similar sites or features;
- The depth of the archaeological deposit (when it can be determined/is known);
- The preservation condition of the sites;
- Potential to answer present research questions.

Furthermore, The National Heritage Resources Act (Act No 25 of 1999, Sec 3) distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- Its importance in/to the community, or pattern of South Africa's history;
- Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
- Sites of significance relating to the history of slavery in South Africa.

5.1. Field Rating of Sites

Site significance classification standards prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report. The recommendations for each site should be read in conjunction with section 7 of this report.

FIELD RATING	***GRADE***	***SIGNIFICANCE***	***RECOMMENDED MITIGATION***
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

5.2 Impact Rating of Assessment

The criteria below are used to establish the impact rating of sites as per the impact rating methodology employed by Savannah environmental:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.

» The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

» The **duration**, wherein it will be indicated whether:

- the lifetime of the impact will be of a very short duration (0-1 years), assigned a score of 1;
- the lifetime of the impact will be of a short duration (2-5 years), assigned a score of 2;
- medium-term (5-15 years), assigned a score of 3;
- long term (> 15 years), assigned a score of 4; or
- permanent, assigned a score of 5;

» The **magnitude**, quantified on a scale from 0-10 where; 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

» The **probability of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where; 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

» The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and

» the **status**, which will be described as either positive, negative or neutral.

» the degree to which the impact can be reversed.

» the degree to which the impact may cause irreplaceable loss of resources.

» the *degree* to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

» < 30 points: Low (i.e., where this impact would not have a direct influence on the decision to develop in the area),

» 30-60 points: Medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),

» > 60 points: High (i.e., where the impact must have an influence on the decision process to develop in the area).

6. BASELINE STUDY-DESCRIPTION OF SITES

At the start of the survey Stone Age material was immediately noticed scattered in varying densities throughout the study area. Therefor low density scatters (between 3 - 5 artefacts per m²) were recorded as find spots. Scatters higher than 5 artefacts per m² were given site numbers and areas where quartzite and quartz outcrops were exploited were also recorded as sites (even though some of them might be of low heritage significance). Two ephemeral pans are located in the north and were also recorded as sites due to the archaeological sensitivity of pans in the area (Kibberd 2006). Scatters with densities less than 3 artefacts per m² were not recorded as they occur throughout the area. Individual occurrences were not point plotted within the recorded scatters however an attempt was made at determining site extent. The use of the term 'site' was entirely arbitrary and does not necessarily reflect a knapping, quarry or habitation site (unless otherwise stated). All recorded occurrences were given a field number and sites were subsequently given site numbers (Table 1 & 2). GPS points were taken at such places and selections of artefacts were photographed.

Compared to the rest of the study area a high frequency of MSA concentrations were recorded in Phase 1, probably attributed to the quartzite ridge (Figure 13 & 14) in this area that was exploited for raw material. In an attempt to show how artefacts increases towards the quartzite ridge in the footprint of phase 1 individual artefacts were recorded in 560meter linear line, walked roughly from the eastern portion of phase 1 towards the west and quartzite ridge (Figure 7).

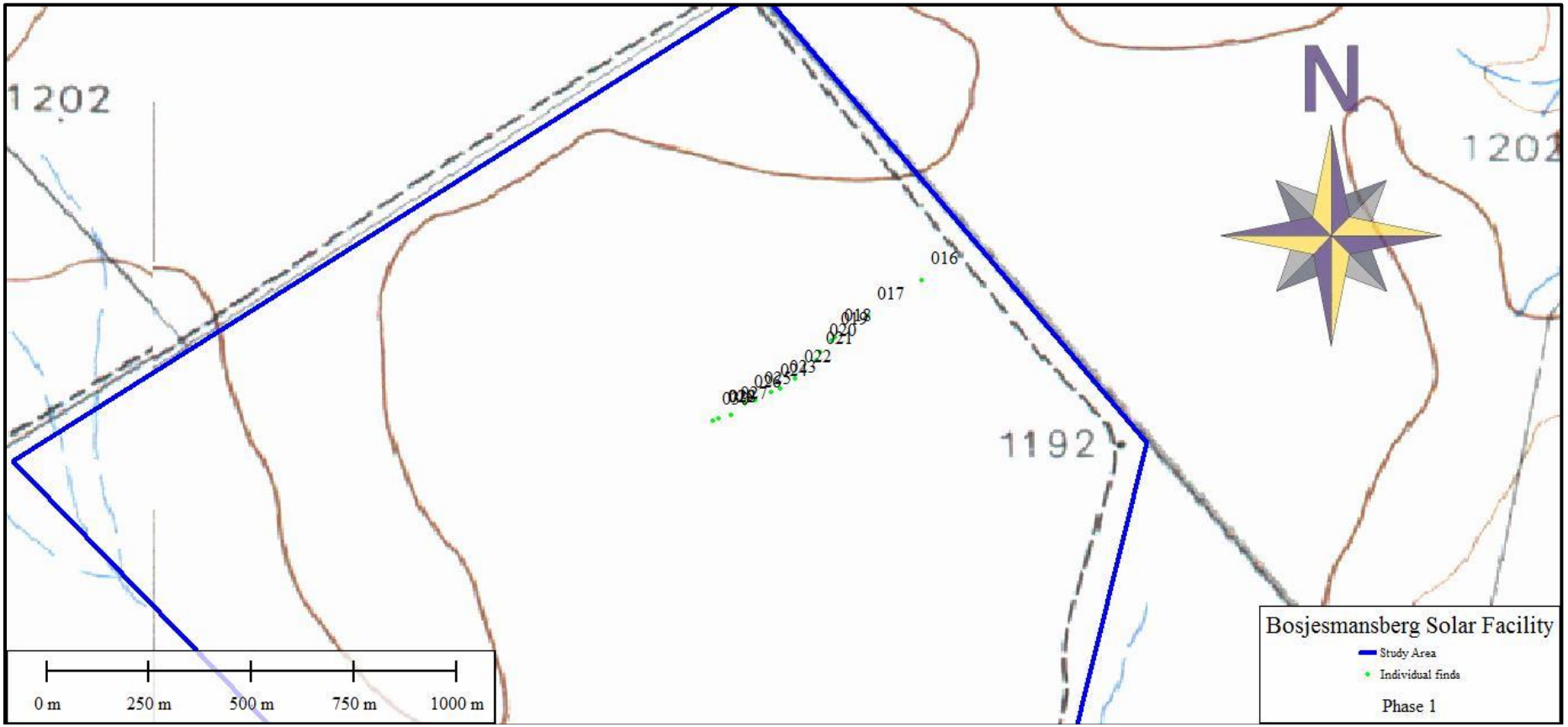

Figure 7: Artefact density test

Similarly a high frequency of LSA (mixed with a lower frequency of MSA) artefacts was recorded in phase 4 on a high lying area next to a drainage line. Both these areas are marked as heritage sensitive areas (Figure 8 & 10) and will require mitigation in order for the development to proceed in these areas.

The study area is characterised by gravel and hard packed (deflated) Aeolian sand on top of a calcrete layer. In these areas MSA tools on the locally available quartzite and quartz are found in abundance with LSA material on CCS. MSA artefacts consisted of large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes. Localised MSA quarries exploiting quartz outcrops, quartzite ridges, bedrock and boulders were also found. This is a widespread occurrence with numerous quarries recorded in the area (Wiltshire 2011; van der Walt 2012). LSA tools (scrapers, retouched and utilised flakes, blades and small round cores) were found in comparatively fewer concentrations compared to the MSA tallies. Several isolated hand axes (e.g Figure 23 & 27) were recorded throughout the area, these artefacts are heavily weathered, rolled and patinated that may indicate their long exposure to the elements and corrosion and that they may not be in situ. Where the Aeolian sand (Figure 11 & 12) overlay the calcrete, artefact counts drastically drop although the odd tool were observed in these areas. In these areas vegetation is also much higher with grasses and shrubs standing 50-70 cm high hampering archaeological visibility. The area of deep Kalahari sands and calcrete exposures is easily visible on Google (Figure 6).

ESA, MSA and LSA artefacts are mixed and indicate that downward deflation had occurred in the study area.

Six sites were recorded and a further total of 36 find spots were mapped (Figure 8 - 10), recorded and in some cases digitally photographed. Again, assemblages at the locations are mixed, mainly consisting of MSA and LSA artefacts with some ESA artefacts recorded.

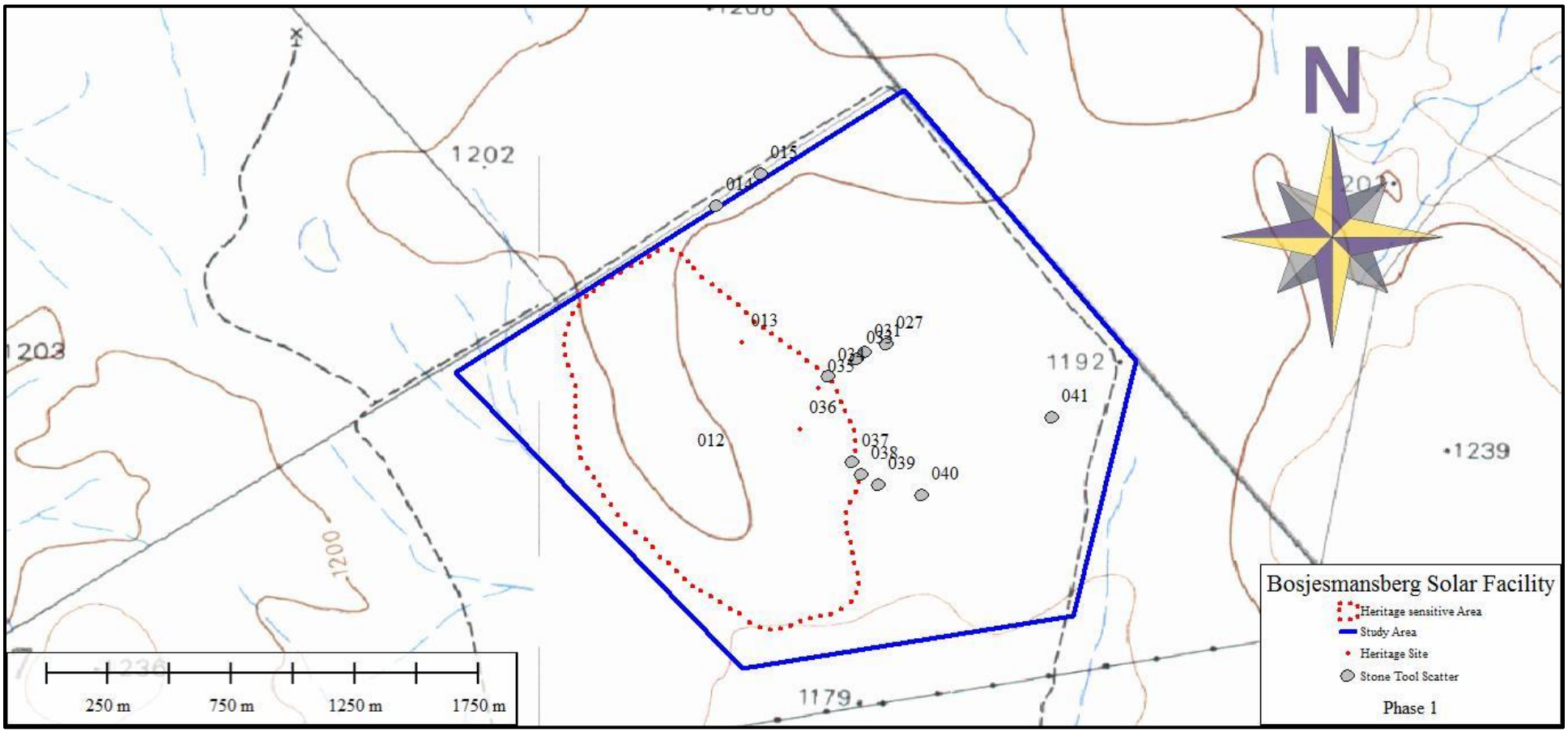

Figure 8. Site distribution map phase 1.

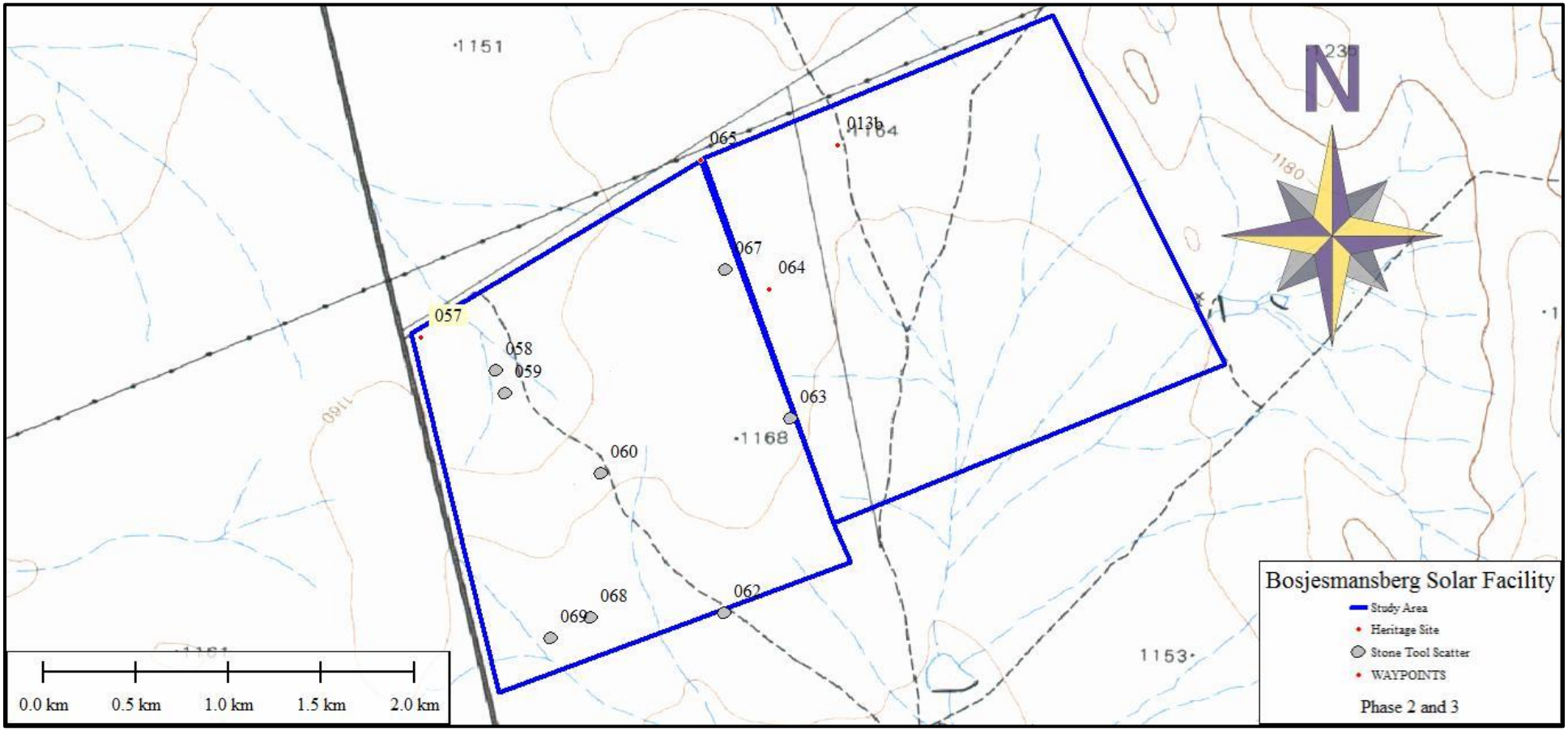

Figure 9: Site distribution map Phase 2 and 3.

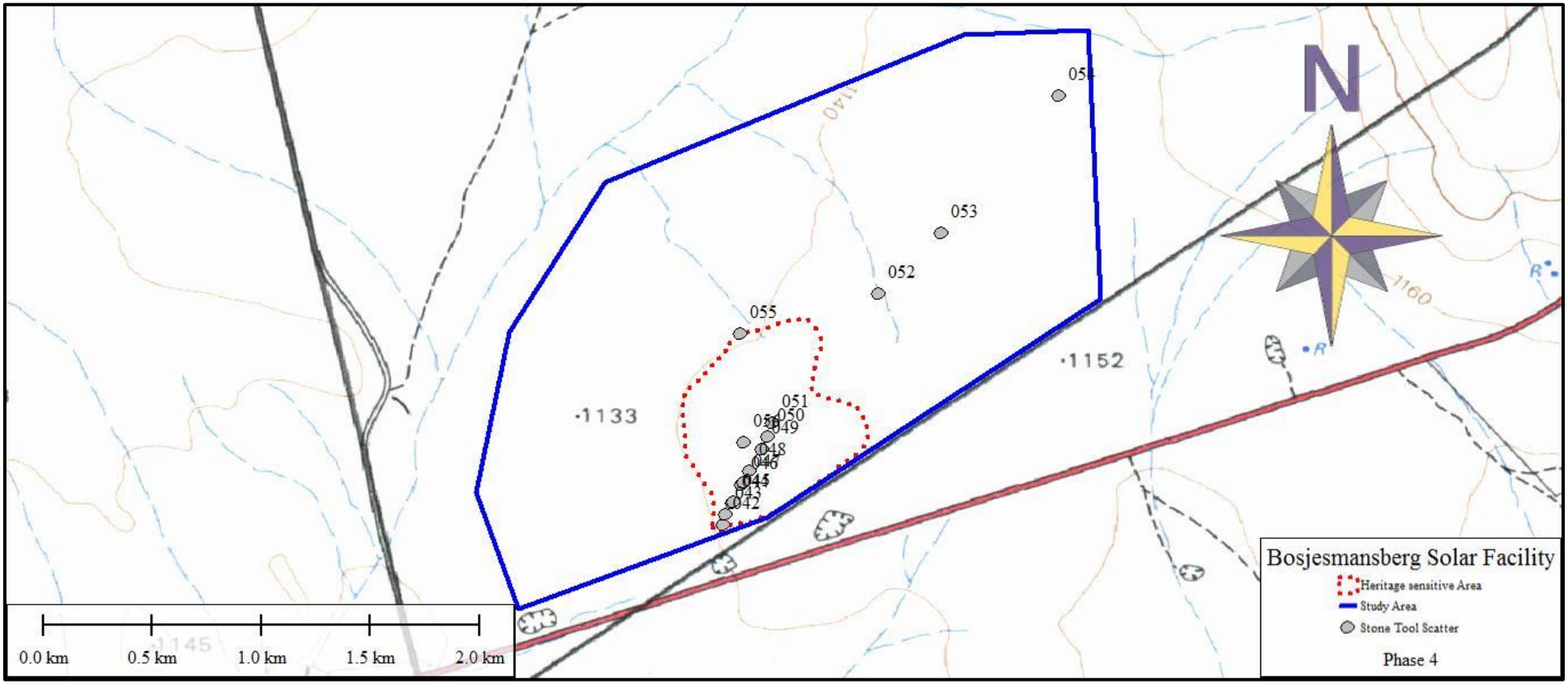

Figure 10: Site distribution map Phase 1.

Figure 11. Aeolian sand in the north eastern portion of Phase 2.

Figure 12. Aeolian sand in the western portion of phase 4.

Figure 13. Quartzite ridge in Phase 1.

Figure 14. Ridge in Phase 1 viewed from the west.

6.1. DESCRIPTION OF FINDS

6.1.1 Sites with Coordinates

Field number	Site Number	Type Site	Cultural Markers	Co ordinate
013 **013b**	**Site 1** **Site 1b**	Pan	Scatter of MSA and LSA around pan eroding out of Aeolian sand	S29 51 26.7 E22 30 24.8 S29 53 04.2 E22 27 37.0
035	**Site 2**	MSA	High density of mostly MSA flakes and tools on quartzite.	S29 51 32.8 E22 30 34.9
036	**Site3**	MSA quarry site	Blue vein quartzite outcrop with scar flaking.	S29 51 38.1 E22 30 32.5
057	**Site 4**	MSA quarry site	Quartzite outcrop with scar flaking. Low density of MSA flakes.	S29 53 37.7 E22 26 24.5
064	**Site 5**	MSA quarry site	Quartz outcrop, pointed flakes dorsal flaking.	S29 53 29.2 E22 27 25.1
065	**Site 6**	MSA and LSA	Rocky outcrop, LSA and MSA	S29 53 06.9 E22 27 13.2

Site 1, Pan with scattered MSA and LSA

Site 1 consists of a pan located in the north eastern portion of phase 1. To the east of the pan is fairly deep Aeolian sand and artefact counts in this area drop drastically. Most of the artefacts in this area consist of MSA flakes and blades with dorsal and lateral retouch, some pieces show signs of being utilised. All the MSA are on the locally available quartzite. LSA are microlithic mostly on CCS. The site falls within a large cluster of a high density artefacts indicated as a heritage sensitive area (Figure 8) Artefact ratio around the pan varies but the highest frequency is found on the eastern and southern side of the pan (>5 per m²).

Site 1b is located in the north eastern corner of phase 2 with a scatter of MSA and to a lesser extent LSA artefacts scattered in varying density's around the pan.

Heritage significance: Generally Protected A (GP.A)

Site 2 and 3, open scatter and quarry site.

Both sites form part of the demarcated sensitive area in Phase 1. Site 2 consists of a high density of artefacts (6-10 per m²) mostly MSA. Artefacts consist of unretouched flakes, blades, radial cores made mainly on the locally available quartzite. Site 3 consists of a blue-grey quartzite outcrop that is fairly low standing, approximately 30 cm above the surface, with some evidence of flake scarring (Figure 16). This may suggest a source for knapping material. Several MSA flakes and possibly some ESA flakes are found scattered around the area with an artefact density of > 5 per m². The area is characterised by hard packed Aeolian sands on top of calcrete and possible extend over 100m².

Heritage significance: Generally Protected B (GP.B)

Site 4, 5 and 6 - quarry sites

Site 4 consists of a blue-grey quartzite outcrop that is fairly low standing, approximately 40 cm above the surface, with some evidence of flake scarring (Figure 17). This may suggest a source for knapping material. A low density of MSA flakes (<2 per m²) are found scattered around this outcrop.

Site 5 consists of a knapping site (Figure 18 -20)where a quartz outcrop was extensively utilised (probably over a long time) resulting in dense concentration of MSA flakes and debitage gravitating downslope (approximately 20 meters). A few quartzite flakes were also noted mixed with the quartz debitage. Site density is approximately >5 per m² over an estimated area of 20 x 13 meter (Figure 15).

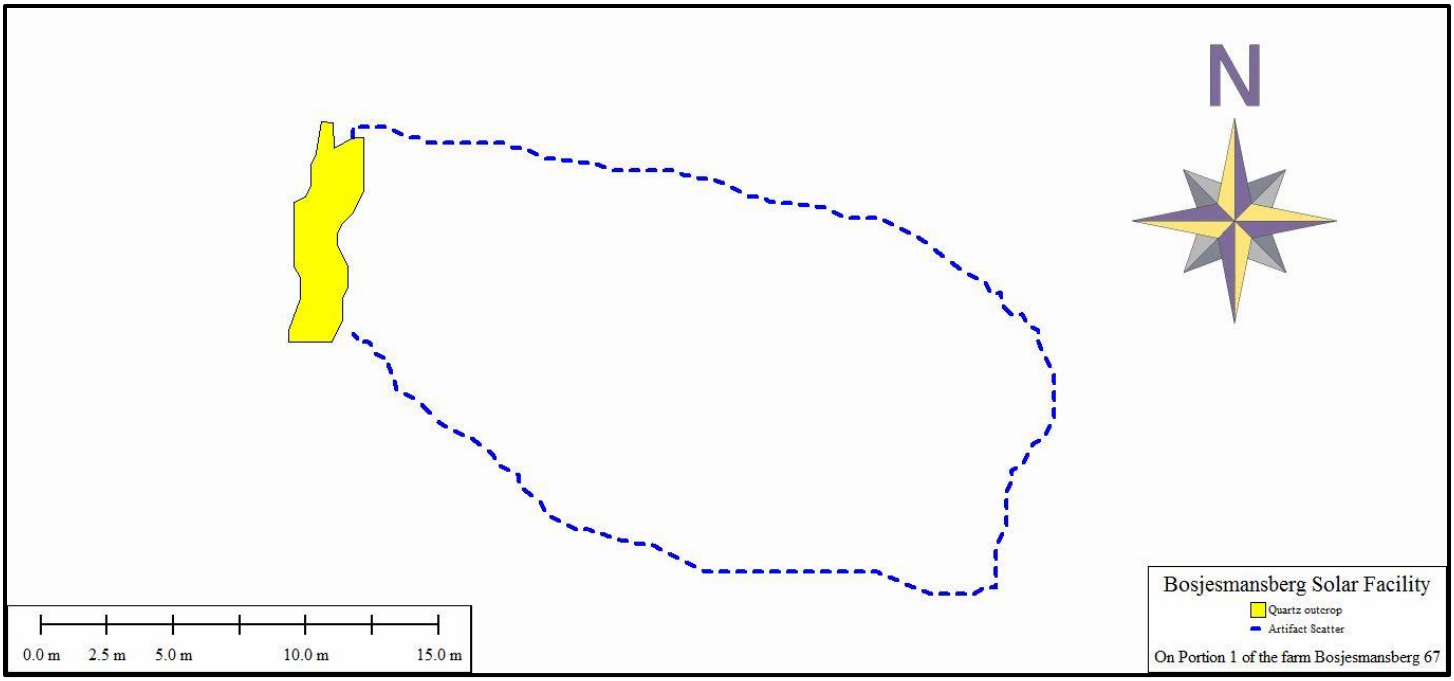

Figure 15: Plan drawing of site 5 extent.

Site 6 consists of a quartzite outcrop with MSA and LSA artefacts (Figure 21) scattered around it with an artefact density of approximately 4 per m². MSA tools is characterised by blades with dorsal retouch on locally available quartzite. The LSA component consists of blades, chuncks, small cores on CCS.

Site 4: Heritage significance: Generally Protected B (GP.B)

Site 5 and 6: Heritage significance: Generally Protected A (GP.A)

Figure 16: Quartzite boulder with flake scarring at field number 36 (Site 3)

Figure 17: Quartzite outcrop with flake scarring at field number 57 (Site 4)

Figure 18: Quartz quarry at field number 64 (Site 5)

Figure 19: Range of artefacts at Site 5

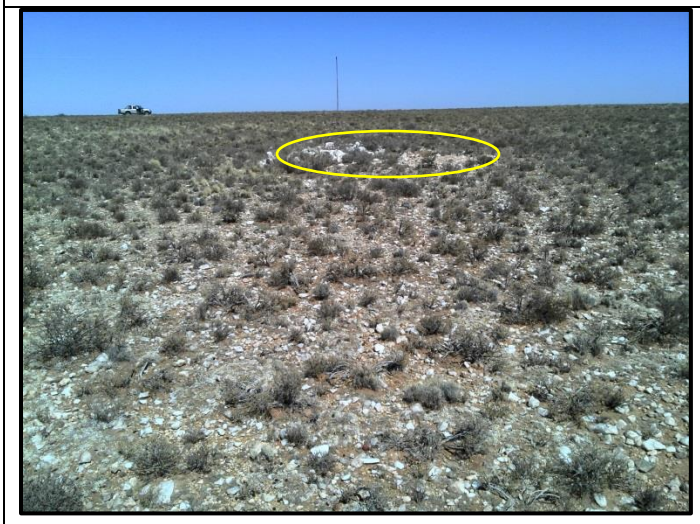

Figure 20: Artefact scatter downhill from quartz

Figure 21: Range of artefacts at field number 65

outcrop (yellow)	(Site 6)

6.2.1 Find Spots with Coordinates

Field Number	Type Site	Cultural Markers	Co ordinate
014	Stone Age	Predominantly MSA with a possible LSA component on hard packed Aeolian sand. Single tool with retouch. Artefact ratio 3 per 2m²	S29 51 08.9 E22 30 21.6
015	Stone Age	MSA triangular flake and an end scraper from quartzite on hard packed Aeolian sand.	S29 51 04.6 E22 30 27.4
027	Stone Age	MSA Flake and blade from quartzite. LSA on CCS (no formal tools). Artefacts exposed on calcrete. Artefact ratio 1 per 2m².	S29 51 27.0 E22 30 43.8
031	Stone Age	MSA flakes on quartzite and LSA cores from CCS on hard packed Aeolian sand. Aartefact ratio 2 per 2m².	S29 51 28.0 E22 30 41.1
033	Stone Age	MSA flakes and blades on hard packed Aeolian sand. Artefact ratio 2 per 2m².	S29 51 29.0 E22 30 40.0
034	Stone Age	Single ESA hand axe and MSA blades and triangular flakes all on quartzite	S29 51 31.3 E22 30 36.2
037	Stone Age	Low scatter of LSA flakes, very heavily rolled/ weathered	S29 51 42.5 E22 30 39.4
038	Stone Age	Low density scatter of MSA and LSA flakes on calcrete.	S29 51 44.1 E22 30 40.6
039	Stone Age	Very low-density scatter of MSA and LSA tools. LSA on CCS 1 core. MSA on quartzite – triangular flake	S29 51 45.5 E22 30 42.8
040	Stone Age	Calcrete protruding through hard packed Aeolian sand. Mostly MSA on quartzite – discoid core and triangular flake. Very little LSA.	S29 51 46.9 E22 30 48.5

041	Stone Age	MSA flakes and blades on Quartzite	S29 51 36.6 E22 31 05.7
042	Stone Age	Single possible ESA tool very weathered. MSA on quartzite – triangular flake and blade. LSA on CCS mostly microlithic flakes without retouch. Artefacts found close to calcrete with thin sand cover.	S29 56 24.9 E22 27 52.2
043	Stone Age	Very low density scatter of MSA tools – triangular flakes etc	S29 56 23.3 E22 27 52.5
044	Stone Age	Very low density scatter of MSA tools blades etc	S29 56 21.7 E22 27 53.6
045	Stone Age	Low scatter of mostly MSA flakes and blades on quartzite. Some LSA on CCS, cores, blades and flakes. All on a slight rise with gravel	S29 56 21.4 E22 27 53.7
046	Stone Age	Same geographical area, similar site description	S29 56 18.9 E22 27 54.9
047	Stone Age	Same geographical area, similar site description	S29 56 18.6 E22 27 55.3
048	Stone Age	Same geographical area, similar site description	S29 56 17.0 E22 27 56.2
049	Stone Age	Same geographical area, similar site description	S29 56 13.7 E22 27 58.0
050	Stone Age	Same geographical area, similar site description	S29 56 11.9 E22 27 58.9
051	Stone Age	Same geographical area, similar site description	S29 56 09.8 E22 27 59.5
052	Stone Age	Low density scatters dating to MSA and single ESA hand axe.	S29 55 50.5 E22 25 09.4
053	Stone Age	Low density scatters dating to MSA and LSA on calcrete. Artefact density 2 -2m².	S29 55 41.6 E22 28 24.7
054	Stone Age	As above	S29 55 21.3 E22 28 42.1
055	Stone Age	Low density MSA flakes and blades	S29 55 56.5 E22 27 54.8

056	Stone Age	Single ESA hand Axe	S29 56 12.6 E22 27 55.3
058	Stone Age	Low density MSA on quartzite	S29 53 43.5 E22 26 37.5
059	Stone Age	MSA flakes on quartzite single LSA core on CCS	S29 53 47.5 E22 26 39.2
060	Stone Age	MSA blades and flakes. Artefact ratio 2-3m²	S29 54 01.4 E22 26 55.9
062	Stone Age	Mostly MSA flakes with possible ESA hand axe. Artefact ratio 2 per 2m²	S29 54 25.5 E22 27 17.3
063	Stone Age	Possible ESA artefact close to rocky outcrop	S29 53 51.9 E22 27 29.0
067	Stone Age	MSA triangular flakes and LSA end scraper on CCS	S29 53 26.0 E22 27 17.5
068	Stone Age	MSA flakes and blade on quartzite. Artefact ratio 2 – 5 per 2m²	S29 54 26.4 E22 26 54.1
069	Stone Age	Single ESA hand axe	S29 54 29.9 E22 26 47.2

Artefacts were observed in low densities over much of the study area where Quartzite strongly dominates the MSA component. Artefacts consist mostly of bipolar cores, large flakes and blades with faceted buts. The LSA component is mostly made from CCS and is micro lithic supporting an ascription to the LSA although some pieces might be macro lithic.

Figure 22: Selection of artefacts from field number 014

Figure 23: Range of artefacts at field number 034

Figure 24: Quartzite core at field number 040.

Figure 25: Range of raw material at field number 53.

Figure 26: Quartzite artefacts from field number 62

Figure 27: Possible ESA biface

Impact evaluation of the proposed project on heritage resources

Sites 1 - 4

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Most Likely (4)	Probable (2)
Significance	**44 (Medium)**	**18 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation: It is recommended that the sites should be mitigated through preservation or if this is not possible, excavated and recorded.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

Site 5 and 6

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation (Preservation site)**
Extent	Regional (4)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Most Likely (4)	Probable (4)
Significance	**60** (High)	44 (Medium)
Status (positive or negative)	Negative	Negative

Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
***Mitigation**:* It is recommended that the sites should be mitigated through preservation; these sites are located in a NO GO area.		
***Cumulative impacts**:* Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
***Residual Impacts**:* Depletion of archaeological record of the area.		

Find Spots (36 in total)

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Most Likely (4)	Most Likely (4)
Significance	**36 (Medium)**	**28 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Mitigation will include surface sampling of Phase 1.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: Depletion of archaeological record of the area.		

7. CONCLUSIONS AND RECOMMENDATIONS

Stone Age material is found widespread across the study area but is mostly of low heritage significance. Some sites however are of higher significance and some mitigation are recommended for these sites. The main characteristics of the 4 proposed development phases are that, where the Aeolian sand overlay the calcrete, artefact counts drastically drop, where in sections where deflation of the sand occur Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA) material is found on the calcrete and gravel that is characteristic of the area. The artefacts in the study area is mixed and from open-air scatters making it impossible to comment on ages and industrial affiliations without formal analysis of the material, however some tentative comments on the ages and cultural sequencing in the study area is possible and is discussed briefly below.

Small numbers of isolated ESA (dating to more than 200 thousand years ago) tools were documented consisting of bifaces (handaxes) made from quartzite. These isolated finds are heavily weathered, rolled and patinated that may indicate their long exposure to the elements and corrosion and that they may not be *in situ*. Based on the small sample documented it is not possible to assign these artefacts to any of the three main ESA phases [Earlier to Middle Stone Age transitional phase (of more than 200 thousand to about 600 thousand years ago), the Acheulean technocomplex (about 300 thousand to about 1.5 million years ago), and the Oldowan technocomplex (between about 1.5 and 2 million years ago)]. The lack of small hand axes suggests that the Fauresmith Industry that is considered part of the transitional phase between the Earlier and Middle Stone Ages is not recorded in the study area. The isolated finds will not further our understanding of the ESA of the area and no further action is necessary for this aspect

MSA artefacts were characterised by dorsal retouch and faceted platforms with large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes. Raw material was predominant in locally available quartzite. Localised MSA quarries exploiting quartz outcrops, quartzite ridges, bedrock and boulders were also found. This is a widespread occurrence with numerous quarries recorded in the area (Wiltshire 2011; van der Walt 2012). The MSA in southern Africa date to about 20 thousand to 300 thousand years ago (Lombard et al 2011), without formal analysis it is not possible to assign the artefacts to a technocomplex for accurate cultural sequencing.

LSA tools (scrapers, retouched and utilised flakes, blades and small round cores) were found in comparatively fewer concentrations compared to the MSA tallies. LSA tools are predominantly on CCS. Most of the pieces recorded relate to the manufacture of microlithic technologies that started about 8 thousand years ago in southern Africa and continued until recently (Lombardet al 2011.). Some pieces could, however, be associated with macrolithic phases within the Later Stone Age referred to as the Oakhurst (terminal Pleistocene/early Holocene non-microlithic) technocomplex generally dating to about 7-12 thousand years ago. The lack of any ceramics in the study area eliminates the possibility of the final Later Stone Age or ceramic final Later Stone Age that dates to less than 2 thousand years ago.

The impacts to heritage resources by the proposed development are not considered to be highly significant and the impact on archaeological sites can very easily be mitigated. Other studies (Kibberd 2006), Wiltshire (2011) and Orton (2012) indicated the high archaeological significance associated with pans in the area and there for are the two ephemeral pans (Site 1) in Phase 1 and (Site 1b) in Phase 2 marked as no-go areas with a 100 meter buffer zone from the edge of the pans. If this is not possible test excavations must be completed to check for sub-surface archaeological material

Compared to the rest of the study area a high frequency of MSA concentrations were recorded in Phase 1, probably attributed to the quartzite ridge in this area that was exploited as raw material. Similarly a high frequency of LSA mixed with a lower frequency of MSA artefacts were recorded in phase 4. Both these areas are marked as heritage sensitive areas and will require mitigation in order for the development to proceed in these areas. The larger geographical area is subjected to several renewable energy projects and recently zinc prospecting and these cumulated impacts on the archaeology of the area must be taken

into account Therefore the following recommendations are applicable for Phase 1 and 4 of the development:

- The quartzite ridge, ephemeral pan and Site 2 and 3 in Phase 1 are included in a heritage sensitive area and should be best avoided and included in a **no-go** area. Although there is no evidence of one 'event' in time or a clear 'edge' to the sites because of the widespread scatter of artefacts the loss of this area with such a high density of artefacts necessitates further mitigation if this area cannot be preserved in a **no-go** area mitigation will be necessary in the form of systematic sampling and collection of artefacts, which must be undertaken prior to the construction phase of the project. Phase 4 of the development must also be mitigated because of the high LSA tallies in the area. Although these were not recorded as sites the widespread concentration in the southern portion are likely reflecting a 'ephemeral site' rather than just a find spot or artefact scatter. The distribution of artefacts to be collected must indicated on a scale plan together with a photographic record.
- The archaeologist will require a mitigation permit from SAHRA in terms of Section 35 of the National Heritage Resources Act (Act 25 of 1999). On receipt of a satisfactory mitigation (Phase 2) report from the archaeologist, SAHRA will make further recommendations in terms of the sites such as their final destruction or additional sampling.
- Site 4-6 are located on the peripheries of Phase 2 and 3 of the project and can easily be preserved *in-situ* without any real loss in terms of layout. Especially site 5 and 6 must be preserved while a destruction permit can be obtained for site 4 because better preserved examples exists in the region. The sites must be demarcated with danger tape during the construction phase of the project to protect the site from accidental damage. Due to the nature of a PV plant, security is of utmost importance and no unauthorised pedestrian traffic is foreseen on the area during the operation phase.
- After surface collection and analysis a destruction permit can be applied for the other phases of the development.

No buildings exist on the site and no cultural landscape elements were noted. Visual impacts to scenic routes and sense of place are slightly higher due to the project's close proximity to the road but are still not assessed to be high from a heritage perspective but are assessed independently by a visual specialist as part of the EIA process.

For the proposed power line the following recommendations are made

- » All pans must be avoided with at least a hundred meter buffer zone.
- » On the farm Vogelstruisbult the following sites have been identified as no go areas. VGSTR4, NPRT4 & VGSTR12 (refer to Wiltshire 2011).
- » When the route alignment have been finalised the pylon positions must be subjected to a "walk down".
- » It is recommended that the Bosjesmannsberg to Cuprum option is used as it follows an existing power line and the impact will be localised however large portions of the Bosjesmansberg to Kronos (Alternative 1) was surveyed previously and will not impact on any no-go areas and is satisfactory.

Although some "find spots" will be impacted by the proposed project better preserved representative samples are found in the area like Bundu Pan (Kiberd 2006), Modder Pan (Wiltshire 2011), Hoekplaas (Orton 2012) and no excavations are necessary at these sites.

Due to the subsurface nature of archaeological material and unmarked graves the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

If the recommendations as made in section 8 of this report are adhered to (subject to approval from SAHRA) there is from an archaeological point of view no reason why the development should not proceed

8. PROJECT TEAM

Jaco van der Walt, Project Manager

9. STATEMENT OF COMPETENCY

I (Jaco van der Walt) am a member of ASAPA (no 159), and accredited in the following fields of the CRM Section of the association: Iron Age Archaeology, Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation. This accreditation is also valid for/acknowledged by SAHRA and AMAFA.

I have been involved in research and contract work in South Africa, Botswana, Zimbabwe, Mozambique, Tanzania and the DRC; having conducted more than 300 AIAs since 2000.

10. REFERENCES

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MAPS

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