ARCHAEOLOGICAL IMPACT ASSESSMENT REPORT

FOR THE PROPOSED NOUPOORT CSP PROJECT, NORTHERN CAPE

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EXECUTIVE SUMMARY

Site name and location: The Noupoort CSP Project is proposed to be developed on the Remaining Extent of Farm 207, Portion 1 and Portion 4 of the Farm Carolus Poort 167 located approximately 4 km north west of Noupoort within the Umsobomvu Local Municipality (Pixley ka Seme District Municipality) in the Northern Cape.

1: 50 000 Topographic Map: 3124 BB

EIA Consultant: Savannah Environmental (Pty) Ltd.

Developer: CRESCO Energy (Pty) Ltd

Heritage Consultant: Heritage Contracts and Archaeological Consulting CC (HCAC).
Contact person: Jaco van der Walt Tel: +27 82 373 8491 E –mail jaco.heritage@gmail.com.

Date of Report: 29 October 2016.

Findings of the Assessment:

Savannah Environmental (Pty) Ltd, on behalf of CRESCO Energy (Pty) Ltd, appointed Heritage Contracts and Archaeological Consulting CC (HCAC) to conduct an Archaeological Impact Assessment in terms of Section 38 of the National Heritage Resources Act 25 of 1999 for the proposed Noupoort CSP Project. The proposed facility consists of approximately 240 ha solar field, substation and two power line alternatives.

It is important to note that the entire farm was not surveyed but only the development footprint of the proposed solar facility (including substation and power line options) that was surveyed on foot and by vehicle. After conclusion of the field work the development footprint was slightly altered resulting in approximately 50 ha not being assessed. Based on the findings of this assessment these areas not covered during the fieldwork session are considered to be of low archaeological significance concurring with the findings by Booth (2011 a and b) and Booth and Sanker (2012 c) who conducted studies on the same property under investigation for the Carolus Poort Solar facility, Kleinfontein Solar Facility and Toitdale Solar Facility. It is however recommended that a walk through should be conducted on any areas included in the final layout that was not subjected to a field survey.

In terms of the built environment (Section 34 of the NHRA), no standing structures of significance were recorded in the study area. In terms of the archaeological component of Section 35, isolated Middle Stone Age (MSA) artefacts were recorded scattered over the study area. These artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done in this report. This assessment is in line with the findings made on neighbouring properties (Booth & Sanker 2011a & 2012). Two LSA sites (Field number 5591 and 5601) were recorded along the power line route Alternative 2. The sites are of medium and low – medium significance. Along this route, an historical midden and a ruin were also recorded (Field number 5571 and 5561).

The impacts to archaeological sites by the solar field and substation are negligible and no further mitigation is recommended. Due to the impacts of power line Alternative 2 on sites of significance, power line Alternative 1 is the preferred alternative from a heritage point of view as this option does not impact on any heritage sites.

The impacts to heritage resources by the proposed development are considered to be acceptable if the correct mitigation measures are implemented. If the recommendations made in this report are adhered to and based on the approval from SAHRA we are of the opinion that the project can 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.

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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 Noupoort CSP Project.

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 2016) 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, 13 heritage occurrences and sites were recorded. 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

Field study

Conduct a field study to:

a) Visit the proposed impact areas to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest;

b) Record GPS points of identified as significant areas; and

c) Determine the levels of significance of the various types of heritage resources affected by the proposed CSP facility.

Reporting

Report on the identification of anticipated and cumulative impacts that 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; and
- » 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 reinternment 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 project is proposed to be developed on the Remaining Extent of Farm 207, Portion 1 and Portion 4 of the Farm Carolus Poort 167 located approximately 4 km North West of Noupoort within the Umsobomvu Local Municipality (Pixley ka Seme District Municipality) in the Northern Cape (Figure 1). The study area is located on a flat plain with no major topographical features apart from a few koppies (Figure 2) in the western portion of the study area.

Vegetation cover is low (Figure 3 – 5) and is classified as predominantly False Upper Karoo (Mucina & Rutherford 2006). Historical imagery on Google earth indicates that the land has been fallow for a number of years and used as grazing. The site is located at 31° 09' 59.0314" S, 24° 55' 04.7556" E.

1.3.2. Location Map

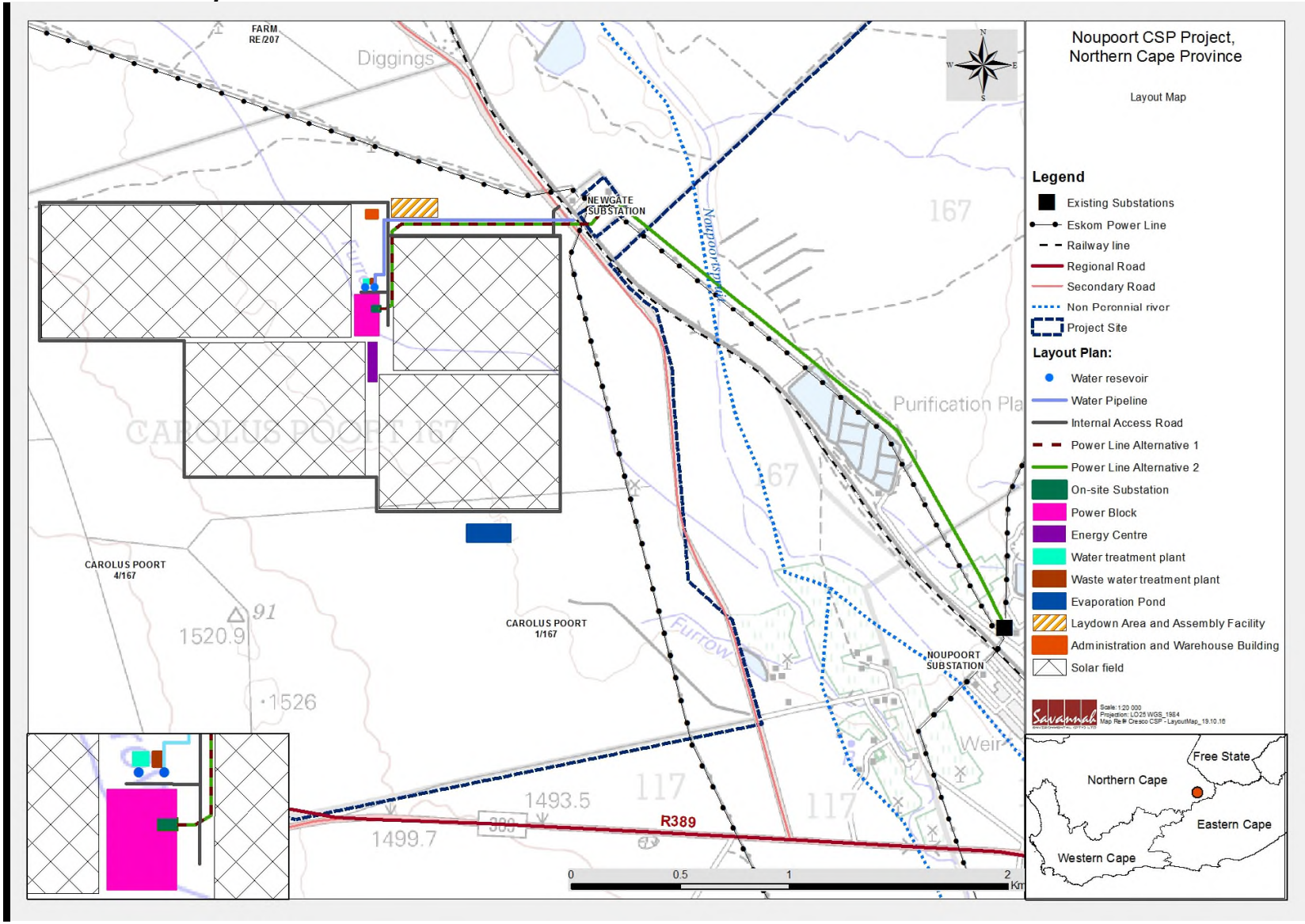

Figure 1: Location map (provided by Savannah Environmental).

Figure 2. Rocky ridge/koppie in the western portion of the study area.

Figure 3. Site conditions in the southern portion of the study area.

Figure 4. General site conditions in the northern portion of the study area.

Figure 5. General site conditions in the central portion of the study area.

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 2016). 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 one of the landowners Mr Jim de Villiers 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 was conducted. The study area was surveyed by means of vehicle and extensive surveys on foot from the 29th of August 2016 to the 1st of September 2016. 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). It is important to note that the entire farm was not surveyed but only the development footprint of the proposed solar facility (including substation and power line options). After conclusion of the field work the development footprint was slightly altered resulting in approximately 50 ha not being assessed. Based on the findings of this assessment these areas not covered during the fieldwork are considered to be of low archaeological significance similar to the findings by Booth and Sanker (2012 c) who conducted studies on the same property under investigation for the Carolus Poort Solar facility, Kleinfontein Solar facility and Toitdale Solar Facility. It is however recommended that a walk through should be conducted on any areas included in the final layout that was not subjected to a field survey.

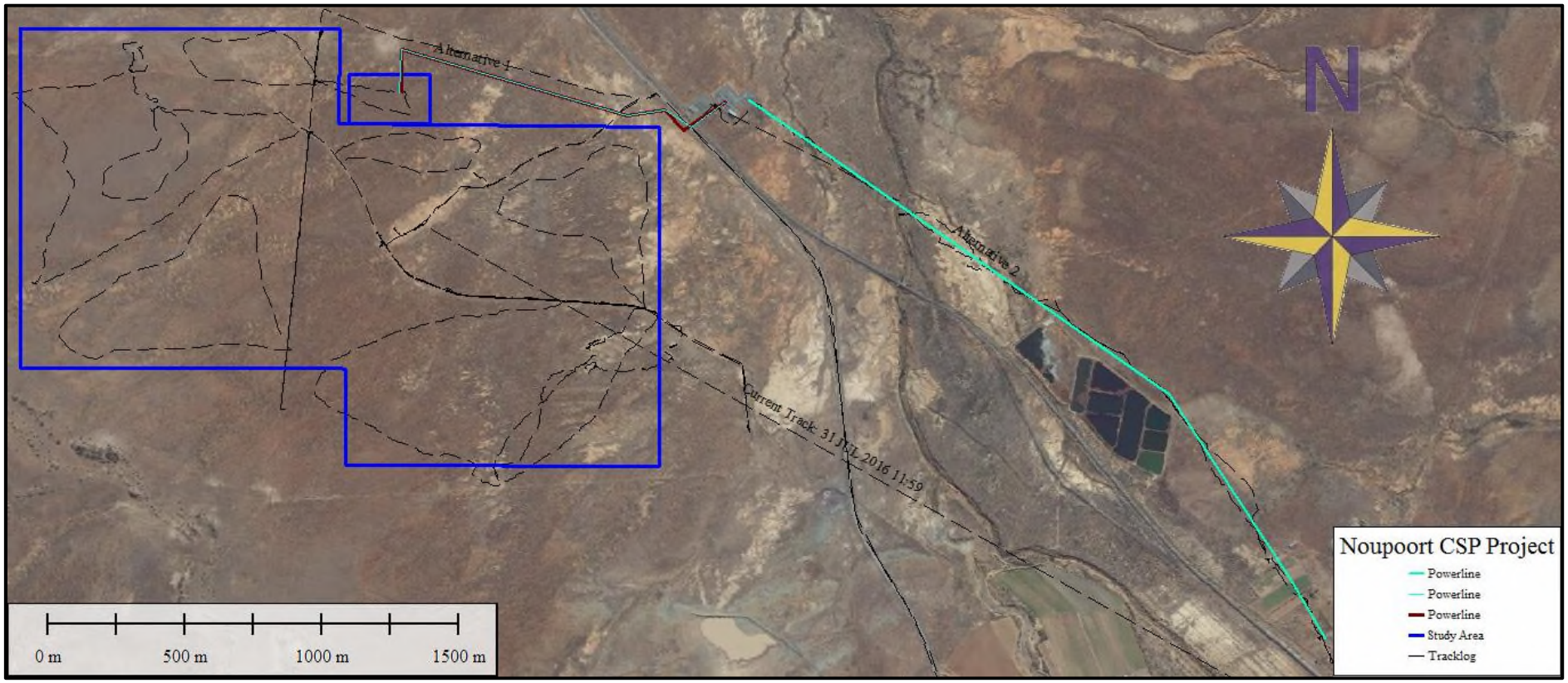

Figure 6. Track logs of the areas surveyed indicated in black.

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 development was surveyed as indicated in the location map, and not the entire farm.

This study did not assess living or intangible heritage or the impact on the palaeontology of the area. 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 proposed Noupoort CSP Project will utilise parabolic trough technology. The parabolic trough system is comprised of a heat collection system (solar field) and an Energy Centre. The heat from the solar field creates steam from the heat transfer fluid (HTF) in a closed loop system which heats the storage medium in the Energy Centre. The HTF (water) in a separate closed loop system is then heated, creating steam and releasing it directly into the turbine inlet, which turns the turbine creating electricity. The project site encompasses 3460 ha and the development area is approximately 430 ha.

Infrastructure associated with the CSP Plant includes:

» Solar collector field comprising of all systems and infrastructure related to the control and operation of the parabolic troughs;
» Energy Centre;
» Power Block;
» Water supply pipeline;
» Water storage tanks;
» Water treatment plant;
» Waste water treatment facility;
» Lined evaporation pond;
» Auxiliary boilers not exceeding 50MWt for the facility start-up/shutdown/maintenance of boiler and steam production stability;
» Workshop and office buildings;
» Access roads and fencing around the development area;
» Plant assembly facility;
» A new 132kV power line to connect the on-site substation to the Eskom grid connection point. Two alternatives are being considered for the grid connection:
  - Alternative 1: Direct connection to the existing 132kV Newgate Substation situated directly across the project site via a ~1,3km overhead power line;
  - Alternative 2: Direct connection to the 66kV Noupoort Substation located 3 km south-east of the development site, as well as to the Newgate Substation. The combined length of the overhead power line will be ~4km;and
» Temporary laydown areas.

4. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND OF THE STUDY AREA

A detailed scoping report was compiled for this project (van der Walt 2016). The scoping comprised a complete desktop study and below is a short summary of the findings.

4.1 Databases Consulted

SAHRIS

The following projects were completed close to the study area.

Author	***Year***	***Project***	***Findings***
J. Nel	2008	Transnet Freight Line	Heritage resources that were identified included fossils, Early, Middle and Late Stone Age, Historical sites and structures and graves over 1200 km.
C. Booth	2011	Kleinfontein Solar	Isolated occurrences of very weathered and patinated Middle Stone Age (MSA) stone artefacts considered to be in secondary context.
F Prins	2011	South Western Karoo Basin Gas Exploration	The desktop study indicated that rock art sites can be expected.
C. Booth and S Sanker	2011	Toitdale Solar Facility	Isolated occurrences of very weathered and patinated Middle Stone Age (MSA) stone artefacts considered to be in secondary context.
C. Booth and S Sanker	2012	A Phase 1 AIA for the Tse Distribution Substation on portion 8 of the farm Damfontein 114, Near Noupoort.	Surface Scatters of MSA artefacts.
A.Van Vollenhoven	2014	Upgrade Of Existing Water Supply Infrastructure At Noupoort	Only one site of cultural heritage importance was identified, the remains of a large graveyard containing at least 1200 graves

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 the study area

The central Karoo has been a focus of archaeological research since the 1960's and Garth Sampson undertook the Seacow Valley research project in the area to the west of Noupoort (Sampson 1985). This included a survey of approximately 5000 km² of the upper and middle parts of the catchment. Numerous pre-colonial stone-built structures were recorded across the landscape and were interpreted to be the kraals of Stone Age herders. The herders are believed to have lived in the valley and the age of the kraals are between AD 1000 and AD 1750 (Sampson 2010). Hart (1989) assembled a typology of kraal types based on analysis of the shapes of the structures. The analysis of the pottery of the Seacow Valley indicated that a number of stylistic changes took place (Sampson *et al.* 1989). Direct dating of potsherds (Sampson 2010; Sampson *et al.* 1997; Sampson & Vogel 1995) indicated that the pottery sequence dated back 1000 years. This information confirmed the ages of the kraals.

Sampson (2010) concluded that three different economies existed in the last 1000 years in the Seacow Valley. These were represented by hunter-gatherers, the so-called 'hunters-with-sheep' and herders. Relationships between the proponents of these three economies are likely to have been quite variable (Smith 1998).

Recently Sampson *et al* (2015) completed a project comprising the conversion of the Zeekoei Valley (also referred to as the Seacow Valley in older literature) Archaeological Project survey data to a GIS format. This conversion allows rapid and accurate analysis of their large hunter-gatherer data-base and classification of several LSA and MSA industries (Sampson *et al* 2015).

Although no kraals were recorded in the study area some are on record for the larger geographical area. Pre-colonial kraals and their distribution on the southern African landscape are not understood well. Quite a few of those recorded lie within the Seacow Valley (Orton 2014). They have also been found as isolated occurrences in amongst others, Sutherland (Hart 2005; Orton & Halkett 2011). They are differentiable from colonial period stone-walled structures by their construction styles: pre-colonial kraals tend to be organic in plan form and built from piled stones and colonial period structures (whether kraals or serving other purposes) were more geometric and built from two packed skins with a rubble fill (Hart 1989). While colonial structures are often clear when located, pre-colonial kraals can be very difficult to spot after many centuries of natural degradation (Orton 2014).

The town of Noupoort was established after the railway line from De Aar to Cape Town was completed in 1881. By 1937 the town was managed by a village administration board, but by 1942 Noupoort became a municipality, mostly revolving around the railway station.

It is still used as a traction changeover facility from diesel to electric locomotives and up to a 100 trains passed through Noupoort daily.

Noupoort became a busy British Military centre during the Anglo Boer War; General French occupied the town in 1899, 20 November. He used the town as a vantage point from where he built up his forces for the advance on Colesberg. The Boers withdrew from Colesberg on 25 Feb 1900. The town also housed a big base hospital with over 800 wounded soldiers (Schoeman 2013). The local cemetery has a garden of remembrance for those killed in the war.

On 17 December 1901 the Boers were forced to cross the railway line south of Noupoort in full view of the British Blockhouses. There was some action in which Commandant Kritzinger was badly wounded and the Hollander Artillery officer Boldingh was killed (Schoeman 2013).

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; and
- 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; and
- 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

It is important to note that the entire project site was not surveyed but most of the footprint of the proposed solar facility and power line options that were surveyed on foot and by vehicle (Figure 1 & 6). It is important to note that the entire farm was not surveyed but only the development footprint of the proposed solar facility (including substation and power line options) that was surveyed on foot and by vehicle. After conclusion of the field work the development footprint was slightly altered resulting in approximately 50 ha not being assessed. Based on the findings of this assessment these areas not covered during the fieldwork session are considered to be of low archaeological significance concurring with the findings Booth (2011 a and b) and Booth and Sanker (2012 c) who conducted studies on the same property under investigation for the Carolus Poort Solar facility, Kleinfontein Solar Facility and Toitdale Solar Facility. The solar field measures approximately 240 ha in extent with power line alternative one measuring ~1.3km and alternative two ~4km. The study area is characterised by relatively flat plains with hard packed sand on top of a calcrete sub strata with sparse grass cover and shrubs (Figure 2,3,4 & 5). In the western portion of the study area a few koppies occur that was thought to be potentially of higher archaeological interest than the flat plains. Indeed higher concentrations of artefacts were recorded in these areas.

Isolated MSA artefacts are observed in low densities scattered over large parts of the study area where hornfells strongly dominate as raw material. Close to the power line alternatives and the Noupoortspruit what is assumed to be ephemeral LSA sites (field No 5591, 5601 extending to 5611) were recorded. The demolished remains of a ruin (Field No 5561) and a historical midden (Field No 5571) were also recorded in close proximity to power line Alternative 2. An existing powerline here already impacted on the sense of place at these sites. The furrow that was indicated during scoping study was found to be silted up and filled during the site visit. Therefore, the furrow is of no heritage significance.

Prof Garth Sampson was consulted regarding the finds in the study area and he confirmed that the artefacts recorded in the solar field date to the MSA (possibly early MSA). MSA artefacts consist mostly of cores and blades. These low density scatters are of low significance and corroborates findings in the area where these isolated artefacts have been given a low significance rating (Booth 2011 a and b). Refer to Figure 19 for the layout of the Noupoort CSP Project overlain by identified heritage features.

Stone Age Find spots (Field No 5482, 5492, 5502, 5512, 5522, 5532, 5541, 5551, 5581)

Isolated Middle Stone Age artefacts are scattered over the solar field and powerline alternatives in very low density's (less than 1 artefact per 10m²). These artefacts are not *in-situ* and are scattered too sparsely to be of any significance apart from noting their presence, which has been done so in this report. These low density scatters are of low significance and corroborates findings in the area where these isolated artefacts has been given a low significance rating (Booth 2011 and b). Artefacts consist mostly of miscellaneous flakes and broken pointed flakes with faceted or plain striking platforms. Raw material consists of hornfells (Figure 8 - 11).

Heritage significance: Generally Protected C (GP.C)

Stone Age Sites (Field No 5591, 5601 extending to 5611)

Two sites were recorded close to power line Alternative 2. Both locations are impacted on by sheet erosion and the forming of dongas. Much of the archaeological deposit is being washed away at these locations. Both areas are marked by MSA artefacts (Figure 13) mixed with LSA artefacts indicating downward deflation at these locations. At field No 5591, a possible stone circle measuring 2 meters in diameter is found with a high frequency of artefacts, Ostrich eggshell (OES) fragments of which some is burned together with burned bone (Figure 12) indicating a possible fire hearth. This indicates possible subsurface archaeological deposit and the fauna here enables dating of the site and therefore this site is given a higher significance rating.

Heritage significance: Generally Protected B (GP.B)

At Field No 5601, a high density of raw material is found and subsequently a high density of artefacts (Figure 15) is found over an area of approximately 65 meters along power line Alternative 2. The recorded artefacts are concentrated over an area of approximately 6 m² and consist of a lower grinder (Figure 14) of blades and microliths.

Heritage significance: Generally Protected B (GP.B)

Historical finds (Field No 5561, 5571)

The remains of a demolished ruin (Figure 16) occur next to an existing power line (Figure 17). It is uncertain if the building used to occur here or if the rubble was dumped here. Topographical maps of the area do however indicate a ruin in the general vicinity. The structure is demolished to the extent that it has no heritage significance apart from recording its presence as done in this report.

At field No 5571 a midden was recorded. The midden is approximately 3 meters in diameter and finds consist of metal fragments and glass bottles (Figure 14).

Heritage significance: Generally Protected B (GP.B)

Table 1. Recorded features with Coordinates

Field No	Type Site	Longitude	Latitude	Elevation	Significance	Impact
5482	MSA Find Spot	24° 55' 21.4283" E	31° 09' 49.3344" S	1471.994751	Low Significance	Solar Field
5492	MSA Find Spot	24° 55' 12.6084" E	31° 09' 51.6636" S	1472.50708	Low Significance	Solar Field
5502	MSA Find Spot	24° 55' 00.4836" E	31° 10' 03.4249" S	1476.726929	Low Significance	Solar Field
5512	MSA Find Spot	24° 55' 11.6075" E	31° 09' 49.5074" S	1478.713989	Low Significance	Solar Field
5522	MSA Find Spot	24° 54' 17.7228" E	31° 09' 16.8011" S	1484.271851	Low Significance	Solar Field
5532	MSA Find Spot	24° 54' 11.5919" E	31° 09' 18.6300" S	1485.68396	Low Significance	Solar Field
5541	MSA Find Spot	24° 54' 06.3252" E	31° 09' 41.8861" S	1491.873657	Low Significance	Solar Field
5551	MSA Find Spot	24° 54' 18.1800" E	31° 09' 36.2232" S	1486.790894	Low Significance	Solar Field
5561	Demolished ruin	24° 56' 37.3741" E	31° 10' 22.0045" S	1480.527222	Low Significance	Solar Field
5571	Historical midden	24° 56' 31.8265" E	31° 10' 14.3651" S	1476.582397	Low- Medium Significance	Power Line Alternative 2
5581	MSA Find Spot	24° 55' 58.1628" E	31° 09' 40.0463" S	1469.657959	Low Significance	Power Line Alternative 2
5591	LSA site	24° 55' 56.5032" E	31° 09' 39.8375" S	1468.099243	Medium Significance	Power Line Alternative 2
5601	LSA/ MSA Site	24° 55' 38.8379" E	31° 09' 25.9417" S	1467.91626	Low – Medium Significance	Power Line Alternative 2

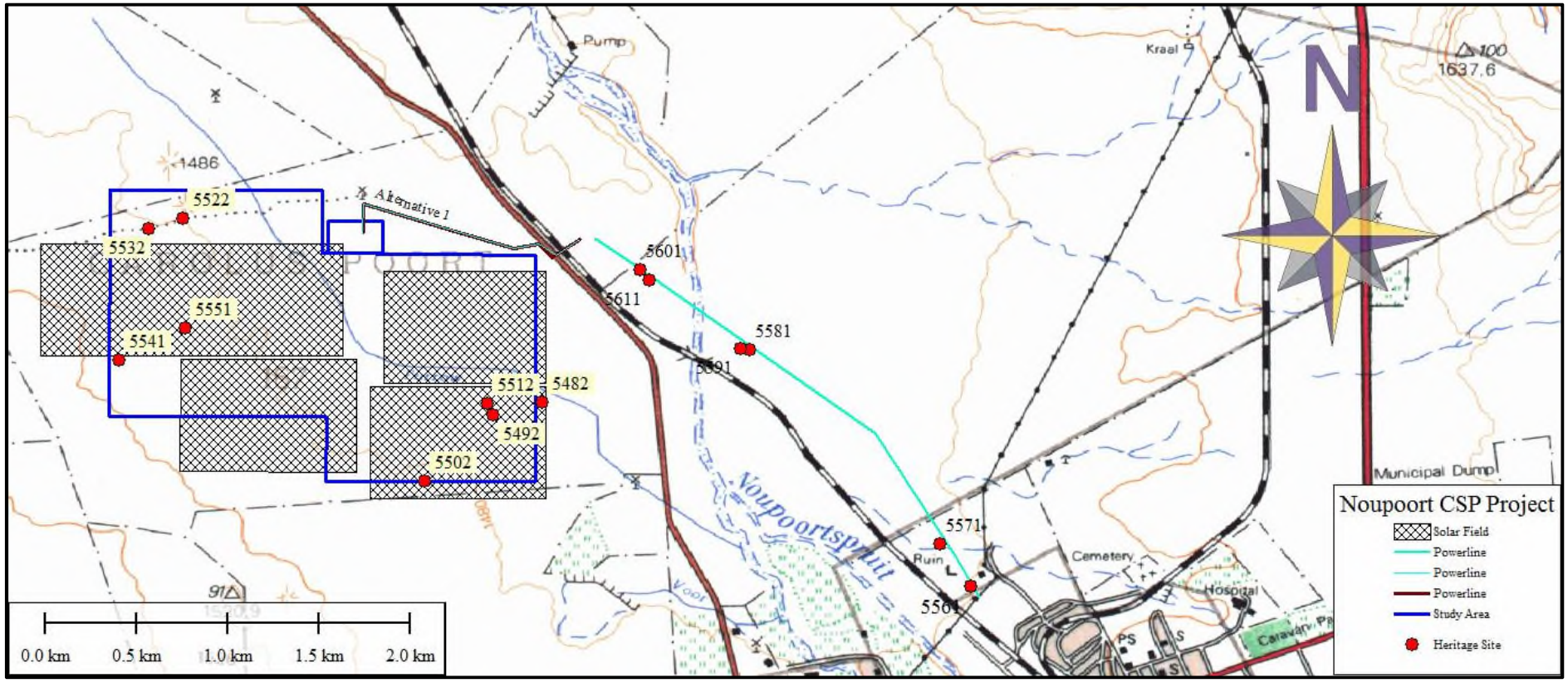

Figure 7: Site distribution map showing recorded sites in relation to the solar field (hatched area) with the blue polygon indicating the original study area.

Figure 8. MSA artefacts from Field no 5492.

Figure 9. MSA artefacts from Field no 5502.

Figure 10. MSA Artefacts from Field no 5551.

Figure 11. MSA Cores and Flakes from Field no 5522.

Figure 12 Artefacts and burned OES and bone from Field No 5591. (*Scale in cm*).

Figure 13 MSA artefacts from Field No 5591. (*Scale in cm*).

Figure 14. Lower grinder from Field No 5601. (*Scale in cm*).

Figure 15. Artefacts from Field No 5601. (*Scale in cm*).

Figure 16. Remains of demolished ruin at Field no 5561.

Figure 17. Existing powerline at demolished ruin at field no 5561.

Figure 18. Artefacts from Field no 5571.

6.1. Impact evaluation of the proposed project and of the proposed power line alternatives on heritage resources

Find spots (Field Number 5482, 5492, 5502, 5512, 5522, 5532, 5541, 5551, 5581).

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	Improbable (2)	Improbable (2)
Significance	**Low (22)**	**Low (18)**
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: These artefacts are not in-situ and are scattered too sparsely to be of any significance apart from noting their presence, which has been done so in this report. Based on approval from SAHRA no further mitigation is required.		
Cumulative impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		
Residual Impacts: N.A		

Stone Age Sites (Field No 5591, 5601)

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)	Regional (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (26)**
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 preserved with a 20 meter buffer zone. If this is not possible and the sites will be impacted on, test excavations must be conducted before a destruction permit can be applied for.		
Cumulative impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area. However if sites are recorded and preserved or mitigated this adds to the record of the area.		

Historical Sites - Midden (Field No 5571)

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	Regional (4)	Regional (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (3)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (24)**
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 preserved with a 10 meter buffer zone. If the sites will be impacted on, test excavations must be conducted before a destruction permit can be applied for.		
Cumulative impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area. However if sites are recorded and preserved or mitigated this adds to the record of the area.		

Demolished ruin (field No 5561)

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	Not probable (2)	Not Probable (2)
Significance	**Low (22)**	**Low (18)**
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: The structure is demolished to the extent that it has no heritage significance apart from recording its presence as done in this report. Based on approval from SAHRA, no further mitigation is required.		
Cumulative impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		
Residual Impacts: N.A		

Cumulative Assessment

Cumulative impacts are not considered to be a major concern for this project.

Through CRM studies for developments in the area heritage sites are identified and protected from accidental damage, this can be regarded as a positive impact as it adds to the heritage database of the area.

In terms of the cumulative impact of this and other developments in the Noupoort area, as there are numerous renewable energy projects in the area (within approximately 30km radius from the proposed project site) (Booth, C. 2011a, 2011b, Booth & Sanker 2012, 2012a, 2012b, 2012c, 2012d, 2012e & Orton 2014) the impact on the heritage landscape is increased slightly. There are currently no other proposed or authorised CSP projects in the Noupoort area.

The impact of the project on identified heritage resources will be mitigated.

Action trigger	**Development impact**
Is the proposed action one of several similar past, present or future actions in the same geographic area?	Yes
Do other activities (whether state or private) in the region have environmental effects similar to those of the proposed action?	Yes
Will the proposed action (in combination with other planned activities) affect any natural resources, cultural resources, socio or economic units, or ecosystems of local, regional or national concern?	There is a secondary impact that can be managed through the correct mitigation.
Have any recent heritage studies of similar actions identified important adverse or beneficial cumulative effects issues?	Data on the heritage resources on the area is being collected through systematic surveys and identified resources are recorded and managed through mitigation.
Has the impact been historically significant, such that the importance of the resource is defined by past loss, gain or investments to restore resources?	Identified resources are being recorded and mitigated for projects such as these that would otherwise have remained unidentified.
Does the proposed action involve any of the following? » Loss of natural habitats or historic character through residential, commercial and industrial development » Social, economic or cultural effects on marginalised communities resulting from ongoing development	Currently the area is not inhabited aside from the farm house. The project and others in the area will have an impact on the cultural landscape, but the social benefits of the project have been classified as beneficial.

The project aims to provide a renewable source of energy to the South Africa power grid. The power generation capacity of South Africa is presently under significant pressure. Therefor the positive impacts of the project outweigh the negative impact on heritage resources of the area that can be successfully mitigated.

Cumulative Impact Assessment

Nature: Heritage impacts associated with the establishment of Renewable energy Facilities on the archaeology of the area		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (5)
Probability	Not probable (2)	Not Probable (2)
Significance	**Low (22)**	**Low (24)**
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: Identified resources are being recorded and mitigated for projects such as these that would have otherwise remained unidentified.		
Cumulative impacts: If sites are destroyed, this results in the depletion of archaeological record of the area. However if sites are preserved or recorded and mitigated, this adds to the archaeological record of the area.		
Residual Impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		

7. CONCLUSIONS AND RECOMMENDATIONS

During the Archaeological Impact Assessment for the project thirteen heritage features were recorded. The survey was conducted over a period of 3 days and focussed on the infrastructure footprint for the project. The heritage features that were recorded consisted of Middle Stone Age scatters, possible ephemeral Later Stone Age sites and a historical dump and ruin. Four of these recorded features consisting of the LSA, dump and ruins will be directly impacted on by the power line Alternative 2.

In terms of the built environment (Section 34 of the NHRA), no standing structures of significance were recorded in the study area. The remains of the demolished ruin (Field no 5561) occur next to an existing power line that has already impacted on the sense of place. Furthermore, it is uncertain if the building used to occur here or if the rubble was dumped here. Topographical maps of the area do however indicate a ruin in the general vicinity. The structure is demolished to the extent that it has no heritage significance apart from recording its presence as done in this report. An associated midden (Field No 5571) with glass and metal artefact was recorded. If impacted on the site should be test excavated before a destruction permit can be applied for the site.

In terms of the archaeological component of Section 35, isolated Middle Stone Age (MSA) artefacts were recorded scattered over the study area. These artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done so in this report. Prof Garth Sampson was consulted regarding the finds in the study area and he confirmed that the artefacts recorded in the solar field date to the MSA (possibly early MSA) and is of low significance. This assessment is in line with the findings made on neighbouring properties (Booth& Sanker 2011 a & b) and no further mitigation are recommended for the MSA find spots. Two LSA sites (Field number 5591 and 5601) were recorded along the power line route Alternative 2. The sites are of medium and low – medium significance. These sites should be preserved with a 20 meter buffer zone or if this is not possible the sites must be test excavated before a destruction permit can be applied for the sites. It is important to note that the entire farm was not surveyed but only the development footprint of the proposed solar facility (including substation and power line options) that was surveyed on foot and by vehicle. After conclusion of the field work the development footprint was slightly altered resulting in approximately 50 ha not being assessed. Based on the findings of this assessment these areas not covered during the fieldwork session are considered to be of low archaeological significance concurring with the findings by Booth (2011 a and b) and Booth and Sanker (2012 c) who conducted studies on the same property under investigation for the Carolus Poort Solar facility, Kleinfontein Solar Facility and Toitdale Solar Facility.

The impacts to archaeological sites by the solar field and associated infrastructure are negligible and no further mitigation is recommended. Due to the impacts of Power line Alternative 2 on sites of significance, power line Alternative 1 is the preferred alternative from a heritage point of view as this option does not impact on any heritage sites.

The impacts to heritage resources by the proposed development are considered to be acceptable if the correct mitigation measures are implemented. If the recommendations made in this report are adhered to and based on the approval from SAHRA we are of the opinion that the project can proceed.

7.1 Reasoned Opinion

From a heritage perspective the proposed project is acceptable if the above recommendations are adhered to and based on approval from SAHRA. HCAC is of the opinion that the development can continue as the development will not impact negatively on the archaeological record of Northern Cape. If during the pre-construction phase or during construction, any archaeological finds are made (e.g. graves, stone tools, and skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds. Due to the subsurface nature of archaeological material and graves the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded, but can be easily mitigated by preserving the sites *in-situ* within the development.

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.

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11. APPENDIX A

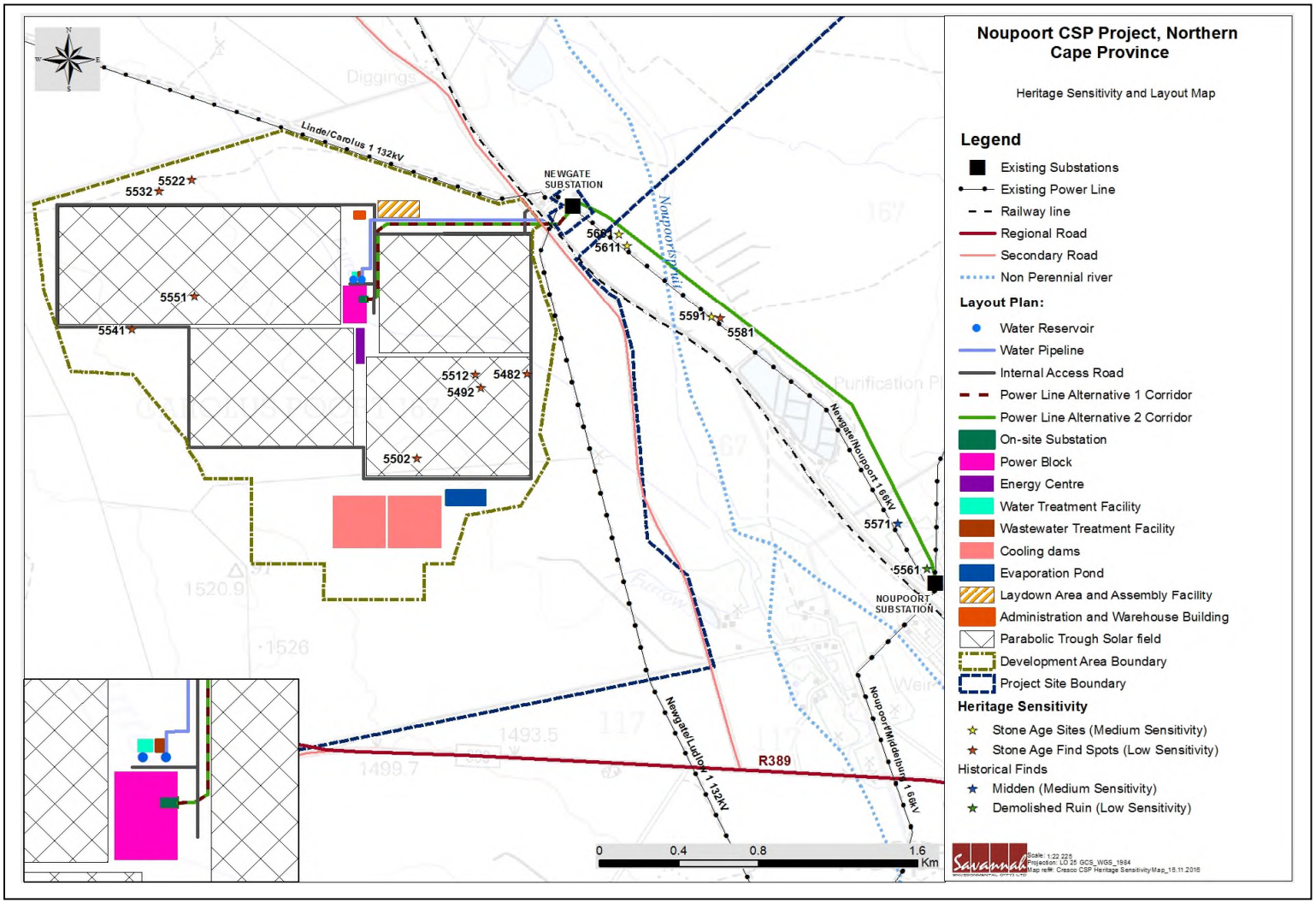

Figure 19: Map showing recorded sites in relation to the layout of the Noupoort CSP Project (provided by Savannah Environmental).