Heritage Impact Assessment of a proposed Wind Energy Facility to be situated on portions of farms Arolsen 69, Farm 148, Farm 148/1; Rooidraai 146, Baviaans Krans 151, Baviaans Krantz 151/2, Klip Fonteyn 150/2, Roberts Kraal 281, Zure Kop 74/1, Zure Kop 74/2, Van Wyks Kraal 73/2 and Van Wyks Kraal 73/3 in the Cookhouse District, Eastern Cape.

Undertaken as part of an EIA in terms of Section 38(8) of the National Heritage Resources Act (No 25) of 1999

District Municipality: Cacadu
Magisterial District: Bedford

Prepared for

Savannah Environmental (Pty) Ltd

On behalf of

African Clean Energy Developments (Pty) Ltd

November 2009

14.12.2009

Prepared by

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Executive summary

ACO Associates cc was appointed by Savannah Environmental (Pty) Ltd of behalf of the proponent African Clean Energy Developments (Pty) Ltd (ACED) to conduct a Heritage Impact Assessment of portions of the farms Arolsen 69, Farm 148, Farm 148/1; Rooi Draai 146, Bavians Krans 151, Bavians Krantz 151/2, Klip Fontein 150/2 Roberts Kraal 281, Zure Kop 74/1 (Highlands), Zure Kop 74/2 (Fairfield), Van Wyks Kraal 73/2 Van Wyks Kraal 73/3 situated between the towns of Cookhouse and Bedford in the Eastern Cape Province of South Africa. The proponents propose to construct a wind energy facility of up to 200 turbines along with up to two substations, power lines to the Poseidon substation and access roads on the 91km^2 area. Heritage indicators identified during this HIA are:

- Middle Stone Age artefacts (low significance)
- Colonial farmstead ruins and associated features (low - medium significance)
- Graveyards (high significance)
- Historic tree lined avenues and windbreaks (low - medium significance)

The provisional turbine layout does not indicate any impacts to identified sites. However, infrastructure (roads) has not been finalised and it is possible that these may result in some impact.

Polygons have been determined around some of the more complex sites, and no disturbance should occur within those areas. Some of these sites must be physically demarcated prior to construction and remain so during the operational phase.

Once turbine and infrastructure layouts are finalised, the plans must be inspected by the heritage practitioner to ensure that no impacts will occur.

Declaration:

Mr Tim Hart, David Halkett and Dr Lita Webley are independent specialist consultants who are in no way connected with the proponent, other than delivery of consulting services.

Tim Hart (MA) is an archaeologist with 22 years of working experience in heritage throughout southern Africa. He is accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

David Halkett (MA) is an archaeologist with 22 years of working experience in heritage throughout southern Africa. He is accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

Lita Webley (Phd) is an archaeologist with 30 years of working experience. Having served previously as Director of the Albany Museum, she is familiar with the history of the area and local heritage issues. She is also accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

GLOSSARY

Archaeology: *Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

Early Stone Age: *The archaeology of the Stone Age between 700 000 and 2500 000 years ago***.**

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.*

Holocene: *The most recent geological time period which commenced 10 000 years ago.*

Late Stone Age: *The archaeology of the last 20 000 years associated with fully modern people.*

Middle Stone Age: *The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.*

National Estate: *The collective heritage assets of the Nation*

Palaeontology: *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

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

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

Structure (historic:) *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

Wreck (protected): *A ship or an aeroplane or any part thereof that lies on land or in the sea within South Africa is protected if it is more than 60 years old.*

ACRONYMS

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

CONTENTS

1. INTRODUCTION

ACO Associates cc was appointed by Savannah Environmental (Pty) Ltd of behalf of the proponent African Clean Energy Developments (Pty) Ltd (ACED) to conduct a Heritage Impact Assessment of portions of the farms Arolsen 69, Farm 148, Farm 148/1; Rooidraai 146, Baviaans Krans 151, Baviaans Krantz 151/2, Klip Fontein 151/2 Roberts Kraal 281, Zure Kop 74/1, Zure Kop 74/2, Van Wyks Kraal 73/2 Van Wyks Kraal 73/3 situated between the towns of Cookhouse and Bedford in the Eastern Cape Province of South Africa (Figure 1). The proponents propose to construct a wind energy facility of up to 200 turbines along with supporting infrastructure. This proposal has triggered a full EIA process, this report being the heritage component.

There is no alternative site for consideration. The power line for the facility will connect either to the existing Poseidon Substation, or directly into existing Eskom overhead lines - the options are not yet finalized between the developer and Eskom. Final infrastructure and layout of the turbines and roads will also only be finalized once Eskom has confirmed connection arrangements, following detailed grid connection assessments.

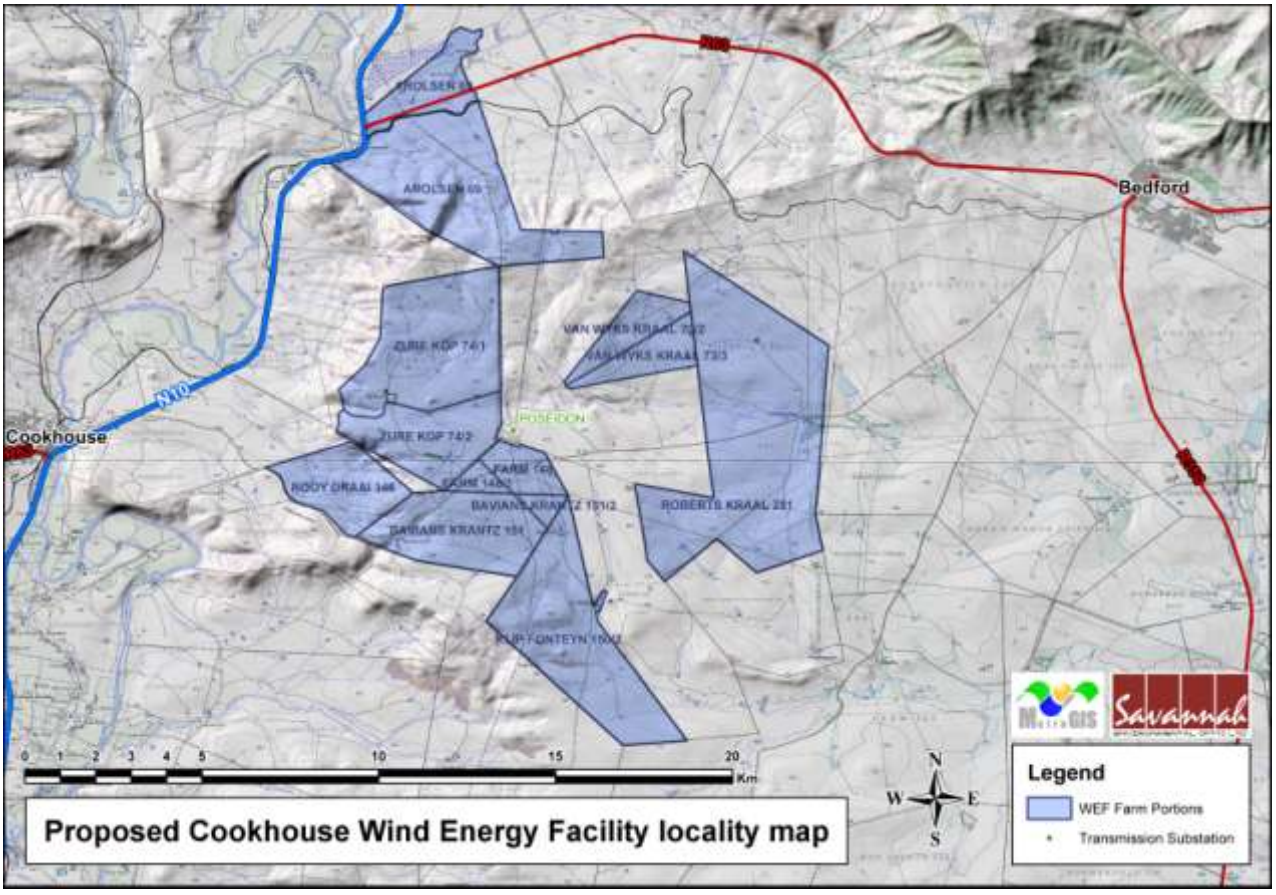

Figure 1: The affected properties in local geographical context

1.1 The need for the project

South Africa is currently experiencing an energy crisis with the national electricity provider (Eskom) being unable to produce enough power to serve the nation's peak demand. In the Eastern Cape the situation is exacerbated by the fact that the province has virtually no generating capacity of its own, with power transmitted from Gauteng and Mpumalanga being the main source of supply. Since the proposed site is very close to the Poseidon substation, the proposed WEF is ideally situated to feed into the national grid and alleviate some of the current loss that is experienced over long distance power line transmission.

1.1.1 The proposal

According to the background information supplied by Savannah Environmental, the turbines are proposed to be positioned over an area of approximately 91km^2. The proponents (ACED), after extensive nationwide feasibility studies have identified this site as being suitable as it is situated on a local elevated plateau in an area where the local topography has created a wind funneling effect.

Infrastructure associated with the wind energy facility will include:

- Up to 200 wind turbines units of two megawatts each, consisting of 80m to 100m high steel towers, with up to 100m diameter rotors with 3x50m blades;
- Concrete foundations of up to 15m x 15m x 2m set in the ground surface to support the turbine towers;
- Underground cables between turbines;
- Up to two substations each approximately 80m x 100m in size to receive generated power via underground cabling from each wind turbine;
- Overhead power lines (132 kV distribution lines) linking into the nearby Poseidon substation;
- Access roads to the site from the main road/s within the area;
- Internal access roads (3-5m in width) to each wind turbine;
- Small office and/or workshop building for maintenance that will occupy a footprint of approximately 150m².

Eskom still has to confirm connection arrangements, after detailed grid connection assessments and therefore a few potential alternatives have been proposed (Figure 2).

- The location of sub-station 1 will be used if Eskom agrees to allow connection directly into the existing 132 kV power line;
- Substation 1A location will be used if the connection is directly into the existing 66kV power line;
- Substation 1B if the connection is directly into the Poseidon substation;
- Substation 2 - there are two further alternative power line corridors, a northern corridor and southern corridor, less than 500m apart. These are both straight line corridors of approximately 2km in length

With regard the power line options, from substation 1A: the light blue line will be along the road reserve, and the dark blue line would follow the 66kv line and would require Eskom's agreement.

With regard to substation alternative 1B; the light blue line would travel directly into Poseidon sub station. It would follow the shortest route on boundary between 2 landowners.

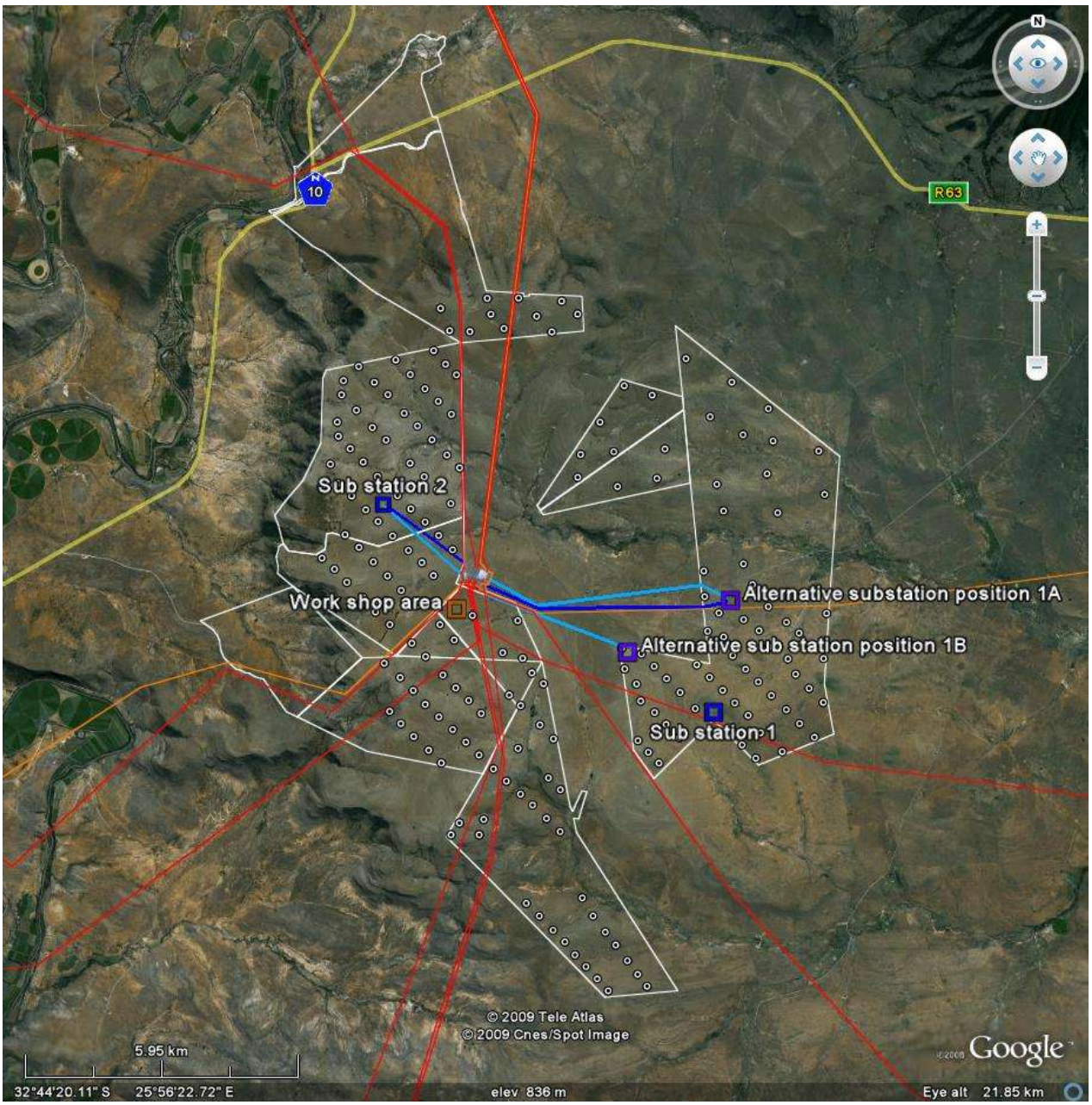

Figure 2: The provisional locations of the substations and alternatives, workshop areas and turbines. Map supplied by Savannah Environmental (Pty) Ltd.

1.2 Terms of Reference

The HIA was required to assess the *construction*, *operation* and *decommissioning* phases of the project and to consider the following:

- Results from a micro-siting exercise to identify technically feasible locations for the placement of each turbine, as provided (Savannah Environmental have indicated that the positions of the turbines are not yet finalized);
- Appropriate alignment alternative/s for the 132kV distribution line between the preferred site and the preferred point of connection to the grid. The alignment/s must be assessed within the EIA phase of the project and a preferred alternative for each point of connection nominated;
- Appropriate alignments/positions for other proposed infrastructure, including access roads, workshop areas, etc (no road alignments were provided).

The ACO was not asked to conduct a palaeontological assessment as part of this report, but Savannah Environmental indicated that they would commission a separate study. Similarly, a separate Visual Impact Assessment (VIA) would be commissioned.

1.3 Legislative context

The basis for all heritage impact assessment is the National Heritage Resources Act 25 (NHRA) of 1999, which in turn prescribes the manner in which heritage is assessed and managed

Loosely defined, *heritage is that which is inherited*. The National Heritage Resources Act 25 of 1999 has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage which must be considered in any heritage assessment includes:

- Cultural landscapes
- Buildings and structures (greater than 60 years of age)
- Archaeological sites (greater than 100 years of age)
- Palaeontological sites and specimens
- Shipwrecks and aircraft wrecks
- Graves and grave yards.

Section 38 of the NHRA requires that Heritage Impact Assessments (HIA's) are required for certain kinds of development such as rezoning of land greater than 10 000 m^2 in extent or exceeding 3 or more sub-divisions, or for any activity that will alter the character or landscape of a site greater than 5000 sq m. "Standalone HIA's" are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils Section 38 provisions.

The Eastern Cape Provincial Heritage Authority is responsible for the management and protection of all provincial heritage sites (grade 2), built environment and structures (grade 3a-grade 3c) in the Eastern Cape. SAHRA Archaeology Unit based in Cape Town is responsible for the management of all archaeological and palaeontological sites in the Eastern Cape. In terms of this particular project both the Eastern Cape Heritage Authority and SAHRA are important commenting authorities but are not responsible for final compliance as this study forms part of an EIA process for which the National Department of Water and Environmental Affairs is the compliance authority (in terms of section 38 (10) of the National Heritage Resources Act).

1.4 The receiving environment

The study area is situated on a raised plateau sandwiched between the Fish River and Karoo escarpment. The site overlooks the Fish River Valley and town of Cookhouse to west, while the small town of Bedford lies to the north east. Being located close to N10 and bracketed by the R63 to the north, the site is easily reached via the national road or even by rail from Cookhouse. Hence the site is well situated in terms of the transport of material and components.

While the main activity in the study area is stock farming, many farmers have begun stocking game. Roberts Kraal, for example, has an area enclosed with a game fence and the farmer hosts hunting. The town of Cookhouse, although it was first established as a military camp, owes its existence to the main eastern railway line from Port Elisabeth to Kimberley. This was built by the Cape Government Railways in the 1880's.

Situated on the edge of the Karoo and the coastal plain, the landscape of the study area is characterized by grasslands and Karoo species (Plates 1 & 2). The edge of the escarpment is mountainous broken by a number of deep valleys, while on the coastal plain, the landscape is characterized by rolling grassland interrupted by river valleys. The plateau which forms the study area has a steeply sloping edge on the western side (Cookhouse) with many steep valleys incised

into the Karoo shales, while on the eastern side the plateau slopes gently down towards Bedford in the North East.

The Poseidon substation is located in the middle of the study area and there are a number of exiting transmission lines and pylons crossing the farms surveyed in this report (Plate 3 & 4).

1.4.1 Pre-colonial heritage

The pre-colonial heritage of the study area has already been outlined in the scoping report and the information will not be repeated here. In brief, not much is known of the archaeology as very little research has been conducted in this area. However, our knowledge of the area indicated that we would find artefactual material dating to the Early Stone Age and Middle Stone Age of the Pleistocene epoch (*3 million – 20 000 years ago)*. When such material is discovered in undisturbed contexts in association with fossil bone, they enjoy high significance in research terms as they have the potential to produce significant information about early human behaviour.

We also expected that we would find Later Stone Age sites attributable to the ancestors of the San people and Khoekhoen pastoralists (after 2000 years ago) in the study area. The San frequented the Karoo and the coastal plains before 2000 years ago. Their legacy includes numerous open sites with stone artefacts, while traces of their presence can be found in most large rock shelters, often in the form of rock paintings. The introduction of pastoralism (sheep and goats, later cattle) roughly 2000 years along with the arrival of the Khoekhoen was a significant event that broke the ancient tradition of exclusive hunting and gathering. The Khoekhoen herders formed powerful transhumant communities (herding cattle and sheep) throughout the coastal plain and from time to time into the Great Karoo (Hart 1987). They enjoyed dominance as far as the Great Fish River where they shared a loose border with farming communities (Xhosa's) to the East.

1.4.2 The colonial period

European farmers (*Trekboere*) were the vanguard of formal colonisation and accelerated the granting of land by the British Colonial Government. The farms which make up the study area were all settled by Dutch speaking farmers by 1825. The implication of this is that the farmers (who were probably *trekboers*) had probably, by that time, already occupied the land informally, the deeds of which were made official by the British Colonial Government.

The Fish River therefore became a frontier zone between the colony of the Cape Province and the Xhosa nation, who for much of the 19th century did their utmost to drive out the settlers (Mostert 1992).

The historic road seems to have followed quite closely the route of the railway line or the N10 but meandered more towards Somerset East rather than Cookhouse. Skead (2007) indicates the area as having been open Karoo veld in parts, but mostly vast plains of sweet grassland. Early travellers noted the presence of large game animals on the coastal plains, as well as hippos in the Fish River. In these game rich areas, claims Skead, the Xhosa had not settled in strength. They had infiltrated as wandering hunters in an advance guard of future occupation and permanent residence by a population moving westwards under pressure from the already settled areas behind them. Here they encountered eastward-moving Whites.

Cookhouse however, seems to have played a minor role in those early years, seldom receiving mention. The area derived its name from an early British military camp kitchen, of which little physical evidence exists today. The closest and oldest military post close to the study area was a small fortified outpost known as the Kaka Post that was built at the foot of the Kaka Berg just to the west of the town of Bedford. Built in 1824 on Landrost Stockenstrom's farm "Maasstrom", it appears that very little of the outpost has survived (Coetzee undated).

The scoping report suggested that the study area does not contain physical material relating to the frontier wars but that remains of early European settlement might be found.

2. METHODOLOGY FOR STUDY

A survey of the study area was conducted by David Halkett and Lita Webley from the 3-5 November 2009. Telephonic contact was made with each farmer and they were questioned about the heritage resources on their farms. The area was then examined by vehicle and on foot, with particular emphasis being placed on the proposed location of the substations and turbines. Prior to the fieldwork, the GPS locations for the farm boundaries, substations and turbines had been loaded onto hand-held Garmin GPS devices allowing these locations to be targeted. The track paths for the survey were recorded are included in this report. A large number of digital photographs were also taken, of which a selection are presented here.

2.1 Restrictions and assumptions

ACO did not survey the individual footprints of each of the 200 turbines as we had been informed that the final positions still had to be determined. The relatively open terrain however meant that we could make reasonably accurate predictions regarding site distribution overall.

In general, the surface visibility is very good and the terrain is very uniform across the various farms. As a result, we were able to make predictions regarding site location with a high degree of confidence.

No information about the access roads was available at the time of the survey but it has been assumed that at least some existing farm roads will be used and widened. Substantial new tracks will however be required for installation and servicing the turbines.

It is assumed that a palaeontologist has been appointed to consider this aspect of heritage.

It is further assumed that a Visual Impact Assessment will be undertaken.

3. RESULTS

The results of the survey are presented in table format in Appendix 1. The table provides site numbers, GPS co-ordinates (WGS84), the site number allocated in the field, site type and a brief description of the observations. The distribution of sites is shown in Figure 3.

3.1 Pre-colonial archaeology

Diffuse and isolated scatters of stone artefacts were recovered on a number of farms. In general, they appear to be of Middle Stone Age date and comprise very heavily patinated (weathered) cores, chunks and flakes (Plate 5). Some of the flakes appear to have retouch along one or more margins and are generally made on indurated shales (hornfels) with the exception of one core made on a dark grey quartzite. These stone tools are frequently found along the margins of small pans or bedrock depressions (Plate 6). However, some stone tools were found along rocky terraces. There also appeared to be an association between stone tools and calcrete exposures. A few large, side-struck flakes could represent the Early Stone Age although no definitive artefacts of this period (handaxes) were observed. None of the surface scatters of stone tools appeared to be in primary context nor associated with non-lithic remains and their significance, in terms of their information value, is therefore considered to be low.

3.1.1 Nature of impacts

The main cause of impacts to an archaeological site is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. The excavations for the turbine platforms, substations and access roads may result in the destruction of some of these surface stone scatters. It is anticipated that the power lines will have less of an impact as the footprint is smaller.

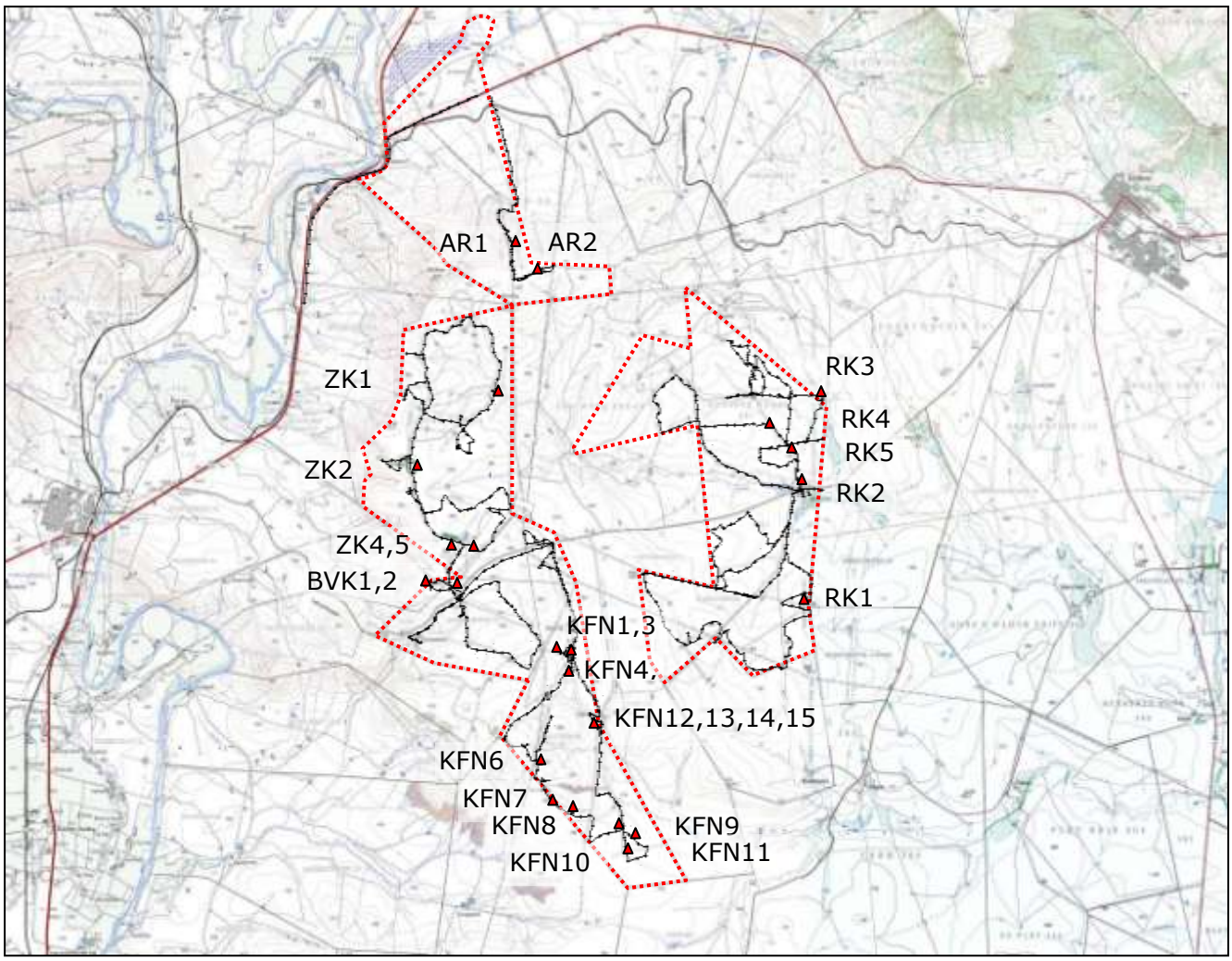

Figure 3: The locations of the heritage sites described in Appendix 1 (red triangles) and track paths (black irregular lines)

3.1.2 Extent of impacts

It is expected that the impacts will be quite limited (local). There is a possibility that the deep excavations for the tower bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact buried material. Potential impacts caused by the power lines and two proposed substations are similarly likely to be limited and local.

Table 1

Nature of impact: The potential impact of the construction of the turbines, substations, access roads and power lines on above and below ground pre-colonial archaeology		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (16)	Low (16)
Status (positive or negative)	Negative	Neutral
Reversibility	No	No
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: No mitigation is proposed as the heritage resources are of low significance. Mitigation will not materially contribute to our understanding of the MSA in the Eastern Cape.
Cumulative impacts: The cumulative impact (during the operational phase of the facility) will probably have a lower impact on heritage resources than during the construction phase. Environmental factors (such as erosion) do have an impact on heritage resources but at a much slower rate.
Residual impacts: n/a

3.2 Colonial period heritage

The scoping exercise identified the possibility of colonial period heritage within the boundaries of the study area. There are historical accounts of European settlement in this area before the 19th century. An examination of the survey diagrams for the farms confirms that they were surveyed around the 1820's and that quitrent was granted in the 1830's. The original owners of the farms were of Dutch extraction. In addition to the existing historic farmhouses which are currently occupied by the farm owners, there are also a number of ruined structures which were identified during the survey. Some were clearly old farmsteads (such as "Ferreira's" house at Roberts Kraal) which have been abandoned for many years (Plate 7). Old refuse dumps are often found close to ruins and ceramics and other material provide a means of dating the sites (Plate 8).There are also a number of stone features consisting of loose aggregations of boulders which could represent early settlement or possibly graves.

Other features include: a stone kraal/s, stone boundary/fence poles (Plate 9), an historic quarry (Plate 9a) and a circular threshing floor (Plate 10).

A number of cemeteries as well as more informal groupings of graves were identified during the survey (Plates 11, 12, 13, 13a, 14, 15). While only a few graves have formal headstones with inscriptions, many have small head and footstones. One cemetery on Klip Fonteyn (KFN 13) contains early graves, some with Dutch inscriptions, although in the majority of cases, the individuals are unnamed. While some graves at KFN 13 are elaborate structures, most graves are simple mounds covered with locally collected stone. Some of the graveyards clearly are those of farm workers. Many of the graves are over-grown and a number are damaged by burrowing animals, primarily aardvark. Graves are rated as having very high significance in terms of heritage value and are afforded special protection by the NHRA. Graves and graveyards which are not the jurisdiction of a local authority are de facto grade 1 sites and the responsibility of the National Heritage Authority - SAHRA.

Tree-lined avenues and windbreaks are found on Zure Kop 74/1 (Highlands) and Zure Kop 74/1 (Fairfield). These are distinctive and can be seen from some distance (Plates 16, 16a).

3.2.1 Nature of impacts

Historic structures are sensitive to physical damage such as demolition as well as neglect. In terms of the agreement between the developer and the farmers, no turbines will be constructed closer than 400 m from occupied farm buildings and are therefore not directly threatened by the installations. Historic structures are context sensitive, and changes to the surrounding landscape will affect their significance. The farmers have indicated that their farms are already crossed with numerous Eskom transmission lines and they have no objection to the visual impact of the turbines on their lands. In the case of Roberts Kraal and Klip Fonteyn, the majority of the turbines will be located behind the houses and will not be immediately visible. The farm house on Highlands (Zure Kop 74/1) is encircled by a row of trees from old windbreaks. Some of the turbines behind the farmhouse on Baviaans Krantz may be visible from the garden.

Cemeteries and graves could be subjected to physical damage by the construction of access roads. In addition, the construction of turbines in close proximity to graveyards will impact on their sense of place.

3.2.2 Extent of Impacts

Direct impacts on identified historic structures are not expected. However, marked buffer zones around cemeteries and graveyards will need to be implemented to ensure that they are not damaged during the construction of access roads or by other related construction activities. A significant negative impact will result from the destruction or disturbance of graves.

Table 2

Nature of impact: The potential impact of the construction of the turbines, substations, access roads and power lines on historic buildings, ruins and other structures, excluding graveyards		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (16)	Low (16)
Status (positive or negative)	Negative	Neutral
Reversibility	No	No
Irreplaceable loss of resources?	Yes, in a few cases	No
Can impacts be mitigated?	Yes	
Mitigation: No mitigation is proposed for the majority of heritage resources identified during the survey, however buffer zones are proposed for some sites.		
Cumulative impacts: If buffer zones are implemented, then the cumulative impacts during the operational phase of the facility are likely to be minimal. Environmental factors (such as erosion) do have an impact on heritage resources but at a much slower rate.		
Residual impacts: n/a		

Table 3

Nature: The potential impact of the construction of the turbines, substations, access roads and power lines on cemeteries and graves		
	Without Mitigation	**With Mitigation**
Extent	Local (5)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very High (10)	Moderate (6)
Probability	Probable (3) with Site	Probable (3) with Site
Significance	High (60)	Moderate (39)
Status (positive or negative)	Negative	Neutral
Reversibility	No	No
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Mitigation is proposed as the heritage resources are of high significance. Mitigation should take the form of implementing no-go buffer zones around all cemeteries and graves.		
Cumulative impacts: If buffer zones are implemented, then the cumulative impacts during the operational phase of the facility are likely to be minimal. Environmental factors (such as erosion) do have an impact on heritage resources but at a much slower rate.		
Residual impacts: n/a		

3.3 Cultural landscape and sense of place

The National Heritage Resources Act does not clearly define the term "cultural landscape". Loosely defined, the concept attempts to explain the temporal and spatial relationship/interaction

between people and their environment and it may therefore be seen as "a particular configuration of topography, vegetation cover, land use and settlement pattern which establishes some coherence of natural and cultural processes" (Patrick 2009).

The proposed facility lies close to the N10 national road and is fairly close to the town of Cookhouse. International experience shows that visual impact and changes to *sense of place* or *setting* are among the most contentious issues that the wind energy industry has had to face in terms of finding social acceptability within a given community. In Europe there is a trend towards small clusters of turbines. South African landscapes are very different – typically arid and vast, and therefore have different capacities in terms of their "aesthetic absorption" ability. Since South Africa does not have well developed guidelines with regard the visual impact of wind energy facilities, the current study is breaking new ground.

3.3.1 Nature of impacts

The construction of a large facility is likely to result in significant changes to the cultural landscape of the area as well as the overall sense of place of the locality. The proposed activity is essentially a visual intrusion that is very difficult to measure. While the local farmers welcome the construction of the facility on their lands because of the financial compensation they will receive, they do not have the experience or knowledge to anticipate the possible visual consequences of the development.

This study predicts that there will, of necessity, be a visual impact on both the historical and natural landscape. One potentially negative impact of the proposed turbines relates to the historic avenues of Eucalyptus trees which run along the farm road to the homesteads on Highlands (Zure Kop 74/1) and Fairfield (Zure Kop 74/2), and windbreak surrounding an old field adjoining the Highlands farmhouse. A number of turbines could be placed in close proximity to the avenues and there is a possibility that the trees may negatively impacted (removed/or reduced) to improve wind flow. It is difficult to put an age to the avenues but it is considered likely that they are at least 60 years of age. These trees are part of the cultural landscape on these farms and can be seen from a distance.

On a smaller scale, comparatively minor factors such as ill-conceived or distasteful signage, "overpowering" entrance gates to sites or security fences adjacent to natural/country areas and scenic drives will constitute a bothersome aesthetic irritation rather than cause serious accumulative damage to the qualities of a "place". These however are easily mitigated through sensitive use of materials and design.

3.3.2 Extent of impacts

Massed wind turbines, are without doubt conspicuous structures which will affect the atmosphere of the "place". While this impact may be considered local in terms of physical extent, there may be wider implications in terms of the change in "identity" of the area and the cumulative effect this could have on future tourism potential (not necessarily negative since some tourism may be generated by the presence of such a facility in the area).

The extent of the impact of the turbines on the historic tree avenues on Highlands (Zure Kop 74/1) and Fairfield (Zure Kop 74/2) may potentially be of high local significance should these trees be required to be removed.

It is important to note that the majority of turbines will only be visible from the gravel "Patryshoogte road" which connects Cookhouse and Bedford, predominantly used by the local farming community. There are already significant localised visual intrusions into this landscape from the Poseidon substation and associated overhead power lines. The extent of the impact will therefore be local in nature.

The preliminary layout plan indicates a few turbines located on the edge of escarpment, on the farms Baviaans Krantz 151, Zure Kop 74/2 and Zure Kop 74/1 which will potentially be visible from Cookhouse and along the N10. While the turbines are tall (between 80-100m in height), the

distance from the road of about 5km means that the visual impact may not be highly significant (refer Visual Impact Assessment). They may, however, have a regional impact.

It is noted from the Visual Impact Assessment that there are not many recommendations as to the mitigation of the visual impact of the core facility (besides the placement of the wind turbines further away from visual receptors or the edge of the escarpment) as no amount of vegetation screening or landscaping would be able to hide structures of these dimensions (refer Visual Impact Assessment).

Table 4

Nature: The potential impact of the construction of the turbines, substations, access roads and power lines on the cultural landscape		
	Without Mitigation	**With Mitigation**
Extent	Local/possibly regional implications (2)	Local (1)
Duration	Long term (life span of facility) (5)	Long term (5)
Magnitude	Moderate (6)	Moderate (6)
Probability	Definite (5)	Highly probably (4)
Significance	High (65)	Medium (48)
Status (positive or negative)	Negative	Negative, possibly neutral
Reversibility	Yes (life span of facility)	Yes
Irreplaceable loss of resources?	Yes, but only in limited areas	No
Can impacts be mitigated?	Yes	
Mitigation: Set the turbines back from sensitive receptors		
Cumulative impacts: The cumulative impacts may be significant as further wind farms are planned for adjoining properties.		
Residual impacts: n/a		

4. MITIGATION AND CONSERVATION

There are a number of mitigation measures which will need to be considered during the construction, operation and decommissioning of the facility and these have been briefly alluded to in the tables above.

4.1 Archaeological heritage

The ephemeral stone tool scatters recorded during this survey are of low significance and mitigation will not be necessary. Further, according to the provisional plan provided for the location of the turbines and substations, no archaeological sites will be directly impacted. However, no diagrams have been provided for the access roads. It is presumed that use will be made of existing roads but may have to be upgraded to accommodate large trucks and cranes. It is a given that additional roads will needed to facilitate construction and ongoing maintenance of turbines throughout the study area. These roads may directly impact archaeological sites.

No mitigation of pre-colonial archaeological material is therefore recommended during the construction, operation or decommissioning phase of the facility.

4.2 Unidentified archaeological material, fossils and fossil bone

There is a possibility that archaeological material may be exposed during bulk excavation for the turbine foundations and construction of access roads. All archaeological material over 100 years of age is protected and may only be altered or removed from its place of origin under a permit issued by SAHRA. In the event of anything unusual being encountered, the SAHRA archaeology

unit must be consulted immediately so that mitigation action can be determined and be implemented if necessary (find-stop scenario). Mitigation is at the cost of the developer and diversion of machinery/plant may be necessary until mitigation in the form of conservation or archaeological/palaeontological sampling is completed.

4.3 Built Environment

Based on the provisional information supplied for the survey, it is not expected that any stone structures such as the ruins of old buildings, kraals, etc will be directly impacted by the proposal (Figure 3). Nevertheless, polygons around groups of features has been proposed for sites RK3 (Ferreira's house), KFN1, KFN13, KFN14 and RK2 (cemeteries) and ZK1 (ruins on Highlands) to ensure that they are not accidentally impacted during construction, specifically by access roads.

There must be no access roads, turbines or any disturbance of any areas within the polygons identified in this report.

4.4 Cemeteries and graves

None of the cemeteries and graves identified during the survey will be directly impacted by the preliminary placement of the turbines or substations. However, several of the graveyards, notably on Roberts Kraal and Klip Fonteyn, are located close to existing farm roads. There is a very real possibility that they may be impacted during the construction phase if road upgrading occurs. A polygon has been created by co-ordinates around each of the graveyards and these should be considered no-go areas.

4.5 Cultural landscape and sense of place

While it is anticipated that there will be a significant visual impact on the cultural landscape and sense of place, the large majority of turbines will be located in an isolated area between Cookhouse and Bedford in the Eastern Cape, and will not be visible from the N10 and R63 or from nearby towns. A few turbines, located along the edge of the escarpment, may be visible from Cookhouse, but re-positioning can mitigate this impact. Some turbines and some of the alternate positions for the substations are located close to the Patryshoogte gravel road used primarily by farmers and Eskom employees working at the Poseidon substation and therefore no mitigation is proposed.

Some of the turbines on Zure Kop 74/1 and 74/2 are located in close proximity to historic tree avenues and this report recommends that these avenues are retained. This may require repositioning of some of the nearby turbines.

5. RECOMMENDATIONS AND CONCLUSIONS

This HIA fulfills the requirements of heritage impact assessment as defined in section 38 of the NHRA with the exception of a palaeontological assessment which is being commissioned separately. A visual impact assessment is likely to provide further support for some of the cultural landscape issues identified in this report.

5.1 Sub-station 1

The placement of sub-station 1 is an acceptable position to collect the turbine output from Roberts Kraal and feed directly into existing ESKOM o/h lines.

There are no heritage resources in the immediate vicinity and it is at a considerable distance from roads and houses.

5.2 Sub-station alternatives

Two positions are proposed for sub-stations collecting output from turbines on Roberts Kraal to

then feed power via new o/h lines to the existing Poseidon facility.

Option 1B (near the current wind testing tower) would be the preferred location.
Option 1A is not recommended as it is located adjacent to the Patryshoogte road and would be a significant visual intrusion.

5.3 Sub-station 2

The location of substation 2 as a collector from the western turbines is a considerable distance from any heritage resources would not require any mitigation. Being on an away slope from the road, visual impact is negated to a degree. Power would be fed via o/h lines to the nearby Poseidon facility.

5.4 Power lines

The o/h powerlines linking SS1B (preferred) to Poseidon is acceptable. The presence of existing o/h lines next to the road close to Poseidon tends to absorb any new visual impact.

The o/h powerlines linking SS2 to Poseidon is acceptable.

5.5 Workshop

The position of the proposed workshop is acceptable as there are no heritage resources in the immediate vicinity and it is at a considerable distance from roads and houses.

5.6 Positions of turbines and roads

Until such time as the final turbine positions are established, no road infrastructure can be determined. Consequently ACO are unable at this time to make clear statements about specific impacts that may arise. ACO do however have a good broad knowledge of the sites and foresee only minor problems in this regard.

Account must be taken of the sites identified in the report in relation to placement of turbines and roads (including upgrading of the existing roads). The heritage specialists must examine final layouts prior to implementation.

Sensitive sites must be physically identified and cordoned to prevent any accidental incursion and damage during the construction and operational phases. It must be remembered that hand held GPS co-ordinates are not absolute and it may be necessary for the archaeologist to physically identify exclusion zones in the field.

5.7 Heritage sites

This report has identified the most significant heritage issues (Appendix 2) which are potentially threatened by the facility. They include:

- graveyards (high significance),
- the ruins of old buildings (medium significance),
- historic boundary stones (medium significance),
- historic avenues of trees (medium significance),
- The cultural landscape including visual intrusion of the turbines on the historical and natural landscape.

5.7.1 Artefact scatters

While a number of scatters of stone tools were identified, they are of low significance and no mitigation has been proposed. With regard to the ruins and graveyards, it has been

recommended that no construction of any kind should be permitted within the polygons provided in Appendix 1.

5.7.2 Ruins and graveyards

ACO recommended that these be physically identified and cordoned during the construction and operation phase of the project using appropriate materials.

5.7.3 Cultural landscape

In terms of the cultural landscape qualities of the site, impacts are expected. The degree and nature of the impact will depend on how the wind turbines are arranged on the landscape. A Visual Impact has been conducted on the visual impact of the placement of the turbines, particularly those located close the edge of the escarpment, and their visibility from Cookhouse and the N10 evaluated. It is important that the historic tree avenues on Zure Kop 74/1 and 74/2 are retained.

5.8 Further work

Plans for the final positions of turbines, road infrastructure and any changes to sub-station positions must be inspected by the archaeologist prior to implementation.

Measures for inclusion in the draft Environmental Management Plan must be laid out as detailed below:

Table 5

Objective: To ensure the conservation of heritage resources in the affected area through the implementation of appropriate mitigation measures.		
Project component/s	Road infrastructure, substation/s, workshop/s, turbines, construction camp/s.	
Potential impact	The destruction of non-renewable heritage resources	
Activity/risk	The construction of pylons, substations, workshops, roads, construction camps may result in the destruction of heritage resources	
Mitigation: Target/Objective	• Pre-colonial artefactual material – no mitigation required; • Built environment (old structures and ruins), Graveyards & Cultural Landscape (historic tree lines) – avoidance as per polygons provided. Avoidance areas to be identified in the field prior to construction phase.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Final layout plans for all infrastructure and schedule of construction to be supplied to heritage practitioner for assessment of possible impacts	Engineering contractor and heritage practitioner	Prior to construction phase
Field visit to identify and cordon off sensitive heritage sites/areas	Heritage practitioner and building contractor	Prior to construction phase
Performance Indicator	Visual inspection of the identified targets to determine that there has been no change of existing condition	
Monitoring	Construction schedule to be supplied; Initial site visit with contractor to cordon off sensitive sites; Single site visit after installation of road system for turbines.	

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APPENDIX 1: LIST OF HERITAGE SITES

Site	Field no	Lat/Lon (decimal°)	Type	Description
AR1	254	S32.68748 E25.92091	ruin	"Veepos" with nearby stone kraal. Not in the main turbine area.
AR2	255	S32.69446 E25.92424	artefact scatter	Scatter of patinated MSA (possibly some ESA) artefacts around the edge of a small pan.
RK1	106	S32.76202 E26.00009	isolated feature	4-5 stone features comprising cobbles. One of the features forms a small circle. There are some bits of wire, some asbestos sheeting and a piece of glass associated with this but no clear evidence for earlier settlement. Uncertain what this represents
RK2-1 RK2-2 RK2-3 RK2-4	202 203 206 207	S32.73836 E25.99923 S32.73815 E25.99961 S32.73773 E25.99932 S32.73779 E25.99906	graveyard	Between 50-100 graves. The graves consist of earth mounds packed with undressed stone, with head and foot stones, aligned in an east-west direction. One grave contains red brick in the packed stone. (Co-ordinates indicate a polygon encompassing the visible graves)
RK3-1 RK3-2 RK3-3 RK3-4	205 208 209 210	S32.71972 E26.00493 S32.72026 E26.00489 S32.71973 E26.00529 S32.72029 E26.00536	farmstead	"Ferreira's House" (according to the farm owner). The main house consists of a base of dressed local stone (shale?). There is a small stone stoep (facing west) with two stone steps. The house is built of sun dried red bricks, also used for the interior walls. There appears to be at least 3 rooms, the voorkamer, agterkamer, and a possible kitchen at the rear. A red brick concentration (back left) may represent a hearth. The house is approx 8.5 m (l) x 10.5 m in (w). The voorkamer appears to be approx 2 m in width. Also a possible outbuilding to the ne. A rectangular undressed stone foundation, 3 x 4 m, with evidence of vertical, wooden posts. There appear to be 2 graves to the se of the ruin. Areas of stone concentration but not specifically in the shape of a grave. At least 3 rubbish dumps, 2 north of the house, and 1 to the south. Distinct mounds with large amounts of glass (complete blue glass bottle, dark green glass bottle pieces with push up base), metal (square headed nails, metal belt buckle, and decorative metal work), bone fragments and ceramics. Ceramics are primarily refined earthenware and include spongeware, flow-ware, annular ware, transfer ware, black, blue, green and mauve transfer print, salt glazed stoneware, ceramic figurine/doll, etc. (Co-ordinates indicate a polygon encompassing the visible features described above)
RK4	211	S32.72504 E25.99097	artefact scatter	Marginal MSA site, of 3 weathered artefacts found in gravel road. Including 1 snapped blade.
RK5	212	S32.72946 E25.99538	artefact scatter	Concentration of stone tools (MSA?) on a calcrete surface. About 15 artefacts made on hornfels? Weathered blades and flakes.
KFN1-1 KFN1-2 KFN1-3 KFN1-4	224 225 226 227	S32.77244 E25.93363 S32.77280 E25.93358 S32.77283 E25.93376 S32.77249 E25.93386	graveyard	12 graves are lying in an exposed slope. They consist of stone cairns with some having head and foot stones. (Co-ordinates indicate a polygon encompassing the visible graves)
KFN2	253	S32.77221 E25.93386	isolated feature	There is a line of stones possibly representing a wall?
KFN3-1 KFN3-2 KFN3-3	228 229 230	S32.77298 E25.93576 S32.77322 E25.93567 S32.77333 E25.93557	stone posts	3 upright stone blocks (boundary posts?) set in ground
KFN4-1 KFN4-2 KFN4-3 KFN4-4 KFN4-5	231 232 233 234 235	S32.77563 E25.93641 S32.77558 E25.93634 S32.77554 E25.93628 S32.77550 E25.93621 S32.77544 E25.93615	stone posts	5 upright stone blocks (boundary posts?) set in ground. The tallest of the stones is approx 1.6 m
KFN5	quarry	S32.77633 E25.93618	quarry/spring	Quarry (source of the boundary posts?). Now filled with water.

Site	Field no	Lat/Lon (decimal°)	Type	Description
				Title deeds indicate a spring here and so is probably the so-called Klip Fonteyn after which the farm is named.
KFN6	236	S32.79526 E25.92867	artefact scatter	MSA artefact scatter found near a natural bedrock pan on the top of a hill. MSA flake made from hornfels. Material (weathered) includes flakes/blades, a core, flaked cobble and large scraper seemingly in hornfels.
KFN7	237	S32.80380 E25.93246	isolated artefact	An isolated patinated MSA flake
KFN8	238	S32.80555 E25.93712	artefact scatter	MSA artefact scatter on a rocky shelf including cores. Mostly hornfels but saw what appeared to be dark grey quartzite.
KFN9	239	S32.81071 E25.95112	isolated artefact	Isolated stone flake in a track and associated with calcrete
KFN10	240	S32.81406 E25.95187	artefact scatter	Approx 6 MSA flakes and cores (2 very big side struck flakes), found in a track and associated with calcrete.
KFN11	241	S32.81092 E25.95390	isolated artefact	Isolated MSA flake, heavily patinated.
KFN12	242	S32.78913 E25.94456	agricultural feature	Threshing floor (wheat) defined by stone surround
KFN13-1 KFN13-2 KFN13-3 KFN13-4 KFN13-5 KFN13-6	243 244 245 246 247 242	S32.78866 E25.94492 S32.78865 E25.94471 S32.78887 E25.94467 S32.78898 E25.94504 S32.78917 E25.94511 S32.78913 E25.94456	graveyard	Includes a formal walled cemetery with 3 graves (1 adult, 2 children). On adult headstone: *"ter gedagtenis van Catharina M de Klerk, gebore 5 November 1812, oorlede 16 Mei 1890".* Inscriptions on children's graves illegible. Surrounding the walled cemetery are at least another 26 graves (see photographs for grave styles). Some additional inscriptions are - on a black slate capping: *"ter gedagtenis Dirk Isak Josephus de Klerk. Ontslaap Mei 1861, ouderdom 29 jaar, 6 maande en 10 dae. En Anna Susannah gebore Bosch…"* . On an upright stone: *"Hier legt begrawe Welm Abraham de Klerk geboren 18 June 1788, is gestorven en den Heren ontslape 17 April 1857".* To the south are at least three possible informal headstones suggesting additional graves. The polygon with corners 13-1, 13-2, 13-5, 13-6 includes all the above features. (Co-ordinates indicate a polygon encompassing all the visible graves)
KFN14-1 KFN14-2 KFN14-3 KFN14-4	248 249 250 251	S32.78798 E25.94374 S32.78788 E25.94394 S32.78832 E25.94417 S32.78837 E25.94387	graveyard	These are likely to be graves of the farm workers probably contemporary with the de Klerk graveyard. There are 3 different types of graves. There is a single, rectangular grave, made of flat stone slabs with a stone headstone. At least 13 packed stone cairns, similar to those in the cemetery, with flat stones packed inward with stone headstones. There are at least 7-10 earthen mounds representing graves, several undermined by antbears which are bringing up items from the graves, including stones and a single piece of pottery. The potsherd is at least 1 cm thick and fairly coarse, with a red slip interior but blackened outer. According to Mr Knott, some human bones have been brought up by antbears although we saw no evidence of such at the time of the visit. (Co-ordinates indicate a polygon encompassing all the visible graves)
KFN15	252	S32.78798 E25.94440	ruin	Stone foundation, possibly a dwelling or a kraal 7.5 m x 9 m.
BVK1	213	S32.75867 E25.89844	stone post	Isolated stone post set into ground (boundary marker?)
BVK2	cairn	S32.76123 E25.90605	stone cairn	Isolated stone cairn (?)
ZK1-1 ZK1-2 ZK1-3 ZK1-4	217-1 217-2 217-3 217-4	S32.71884 E25.91538 S32.71884 E25.91611 S32.71819 E25.91609 S32.71818 E25.91531	farmstead	The site has several components that include: A standing dwelling, a ruin 3.5 m x 5 m, stone features possibly representing 3 graves, ash dump and general ceramic and glass scatter. (Co-ordinates indicate a polygon encompassing the all the visible features described above)
ZK2	256	S32.73471 E25.89369	windbreak	Blue gum trees surrounding an old field
ZK3	219 220	S32.73373 E25.89281 S32.73524 E25.89345	tree lined avenue	Straight avenue of blue gum trees on approach road to "Highlands". (Co-ordinates indicate start and end points)

Site	Field no	Lat/Lon (decimal°)	Type	Description
ZK4		S32.74880 E25.90237 S32.75007 E25.90703 S32.75548 E25.90331	tree lined avenue	Avenue of blue gum trees with 90° bend on approach road to "Fairfield". The two now separate avenues may once have been continuous. (Co-ordinates indicate start and end points)
ZK5	221 222 223	S32.75096 E25.90987 S32.75101 E25.90948 S32.75088 E25.90969	farmstead	There are several components including some large square slabs of rock below a large tree suggest there may have been a house here. There are at least 3 domestic refuse dumps site with bone, glass and ceramics of 19th century age. (Co-ordinates indicate a polygon encompassing all the visible features described above)

APPENDIX 2: SUMMARY OF POSSIBLE HERITAGE ISSUES BY INDIVIDUAL FARM

Farm	Possible heritage issues
Arolsen 69	ruin
Baviaans Krantz 151	boundary post
Baviaans Krantz 151/2	nil
Farm 148	nil
Farm 148/1	nil
Klip Fonteyn 150/2	graveyards, boundary posts
Roberts Kraal 281	graveyard, old farmstead
Van Wyks Kraal 73/2	nil
Van Wyks Kraal 73/3	nil
Zure Kop 74/1	tree lines, old farmstead
Zure Kop 74/2	tree lines, farmstead

APPENDIX 3: PHOTOGRAPHS

Plate 1: The low grass cover with good visibility in the study area. **Plate 2:** Acacias are present in the valleys and in game camps.

Plate 3: The Poseidon substation. **Plate 4:** Current transmission lines crossing Bavians Krantz.

Plate 5: Sample of Middle Stone Age implements found around the pans and on rocky ridges. **Plate 6:** Shallow pan in bedrock on farm Klip Fonteyn (KFN 6).

Plate 7: The ruins of the so-called "Ferreira's" house on Roberts Kraal (RK3) . **Plate 8:** 19th century transfer printed refined earthenware ceramics from the one of the refuse dumps.

Plate 9: The stone boundary/fence posts at Klip Fonteyn (KFN 4). Plate 9a: KFN5: Quarry and spring. We believe that some of the local stone boundary posts originated at this quarry.

Plate 10: The threshing floor at Klip Fonteyn is surrounded by upright stones (KFN 12).

Plate 11: The entrance to the stone walled cemetery at Klip Fonteyn (KFN 13). **Plate 12:** One of the numerous graves on the outside of the walled cemetery with its distinctive circular rock covered grave mound.

Plate 13 and 13a: An earth grave mound with ant bear burrow (KFN 14). A more formal stone covered mound also at KFN 14. Stones offer some protection from burrowing animals.

Plate 14: 12-15 stone covered graves on an exposed slope at Klip Fonteyn (KFN 1). **Plate 15:** 50 -100 stone covered graves lie immediately to the east of the entrance road at Roberts Kraal in an informal cemetery (RK2).


Plates 16 & 16a: A tree lined “avenue” going towards Highlands, and a windbreak around an old field next to the house at Highlands.