

**HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED KHAI-MA
WIND ENERGY FACILITY ON FARM PORTIONS SOUTH OF POFADDER IN THE NORTHERN
CAPE PROVINCE**

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

Prepared for

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EXECUTIVE SUMMARY

ACO Associates was appointed by Savannah Environmental (Pty) Ltd to assess the potential impacts to heritage resources that might arise through construction the proposed Khai-Ma Wind Energy Facility on farm portions south of Pofadder in the Northern Cape Province. The proposed projects will comprise of up to 70 wind turbines producing up to 140 MW of power.

The site is situated in Bushmanland. It lies south of a range of low hills known as Die Poort se Berge and is composed of wide open, flat land covered with grass and small bushes. Small hills do occur and occasional pans and dry stream beds are present.

A field assessment was undertaken from 11-13 November 2014.

The following heritage indicators were identified in the study area:

- The survey revealed that there is a thin background scatter of Stone Age artefacts over the area which is of very low significance; there are few concentrations or definable archaeological sites however. The material is entirely attributable to the Middle Stone Age.
- The abandoned Namies village ruins lie on either side of the current access route from the N14. Widening this road as it is now will result in impacts to archaeology as there are graves and ruins very close to the road. Diverting the road south (as proposed) or using one of the two proposed alternate access roads would mitigate this.
- Scenic impacts will be high due to the remoteness and wilderness qualities of the area, however there are very few visual receptors or tourism in this landscape apart from the homes of the landowners, neither of which have a heritage grading.

Mitigation

No mitigation for the proposed WEF site is required. If the existing access road is to be widened, grave relocations and archaeological mitigation will be required therefore widening of the road, if envisaged is not supported. Diverting the road south of Namies as well using one of the two alternative access roads is supported.

Conclusion

The WEF site is of low heritage sensitivity. We believe that the proposed activity is acceptable with respect the assessed heritage.

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.*

Calcrete: *A soft sandy calcium carbonate rock related to limestone which often forms in arid areas.*

Cultural landscape: *The combined works of people and natural processes as manifested in the form of a landscape*

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.*

Midden: *A pile of debris, normally shellfish and bone that have accumulated as a result of human activity.*

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.*

Pan: *A shallow depression in the landscape that accumulates water from time to time.*

Palaeosole: *An ancient land surface.*

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

Pliocene: *A geological time period (of 5 million – 3 million years ago).*

Miocene: *A geological time period (of 23 million - 5 million 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.*

Acronyms

DEAT	Department of Environmental Affairs and Tourism
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
WEF	Wind Energy Facility
PV	Photo-voltaic (solar) array

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1 INTRODUCTION

ACO Associates was appointed by Savannah Environmental (Pty) Ltd to assess the potential impacts to heritage resources that might arise through construction of the proposed Khia-Ma wind energy facility (Figure 1). Pofadder lies approximately 21 km north-north-east of the study area while Aggeneys is 38 km to the west.

This study is produced under section 38.8 of the National Heritage Resources Act (25) of 1999 as a specialist contribution to an EIR (Environmental Impact Report). Savannah Environmental is undertaking the EIR on behalf of Mainstream Renewable Power South Africa. The project is situated in the Khai-Ma municipality of the Northern Cape Province. The land portions that will be affected are:

- Poortje 209/remainder; and
- Poortje 209/portion 1 (Figure 2).

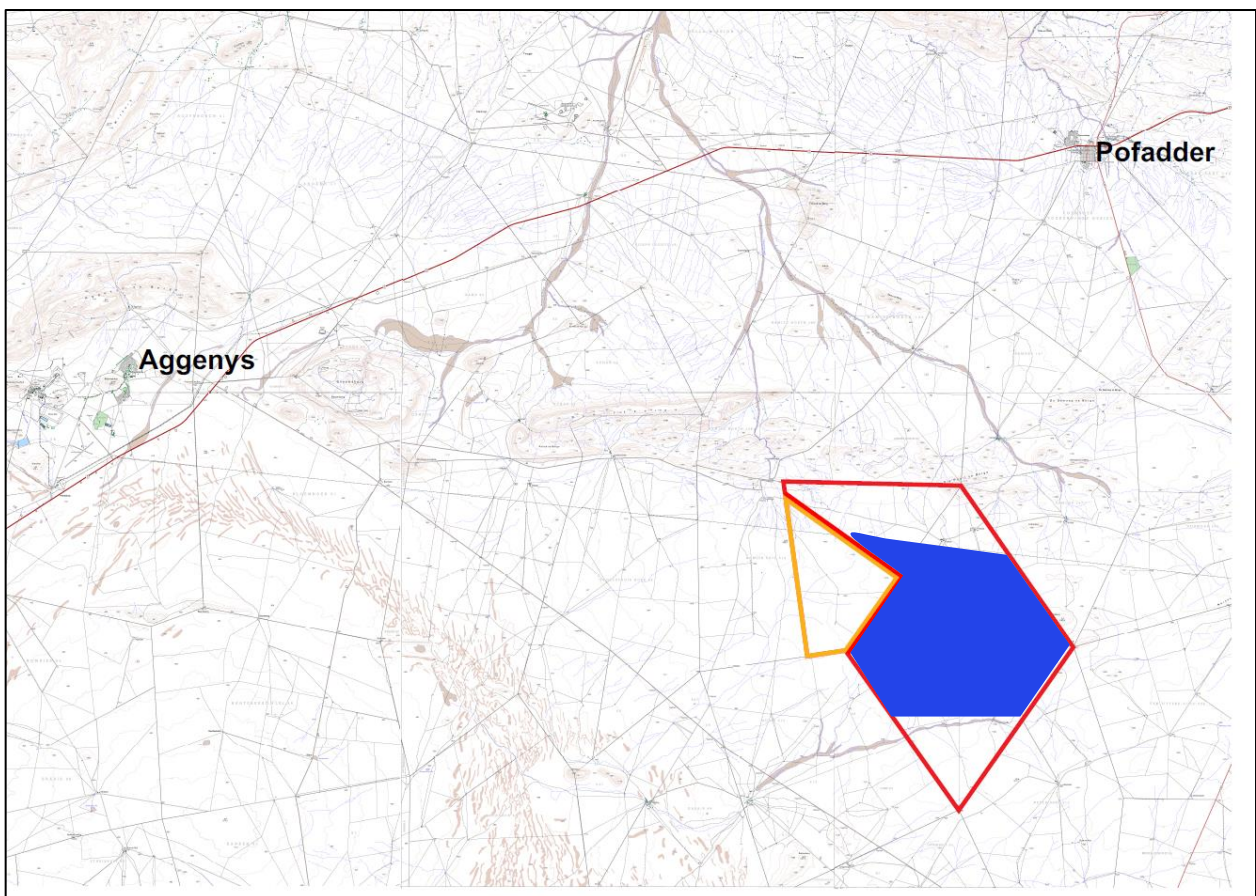


Figure 1: Map (after 1:50 000) of the general vicinity of the study area showing the relationship between it and the two nearest towns. The N14 national road runs east to west through Pofadder and Aggeneys and the R358 runs south through Pofadder. The proposed Khai-Ma facility lies immediately north of the proposed Poortje 140 MW WEF.

1.1 Proposed Activity

The proposed project entails the establishment a 140 MW wind energy facility and will involve the construction of:

- Up to 70 wind turbines (each turbine between 1.5 MW - 4MW in capacity);
- Foundations to support both the turbine towers;
- Cabling between the project components, to be lain underground where

- practical;
- A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys Aries 400kV power line which traverses the site;
- Internal access roads; and
- Workshop area for maintenance and storage.

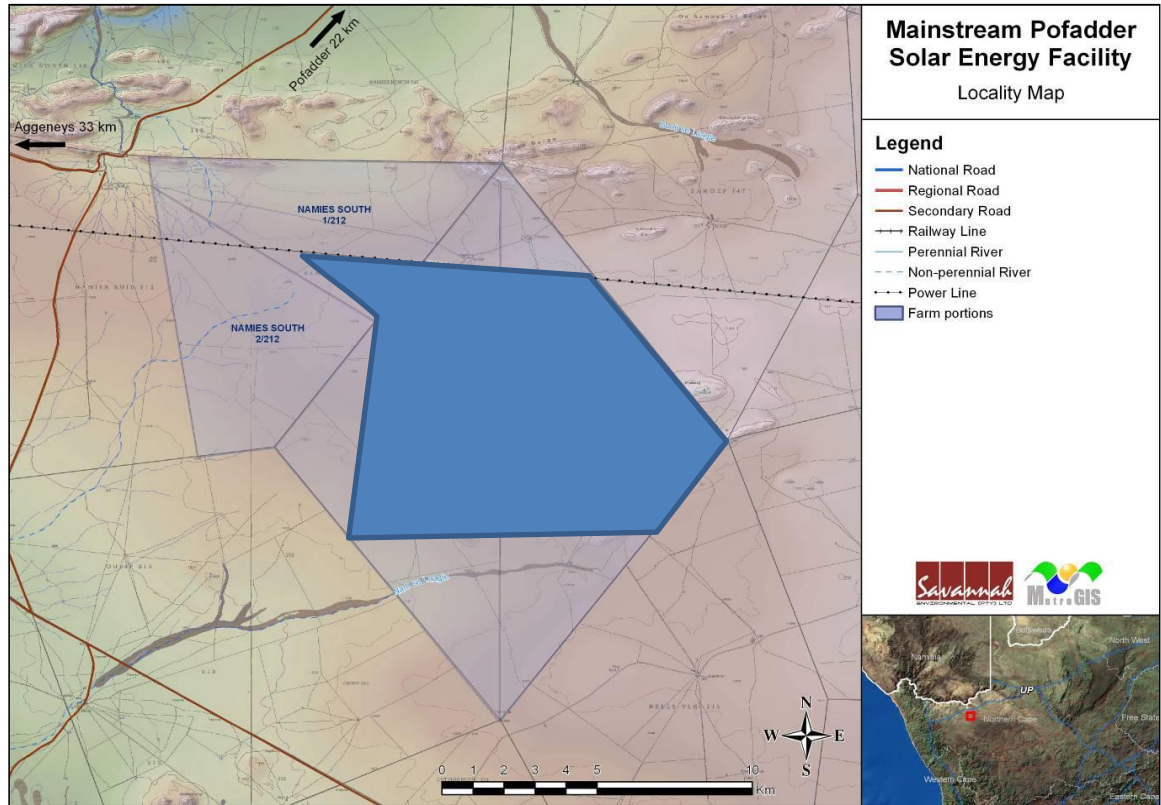


Figure 2: Map showing the affected areas in dark blue.

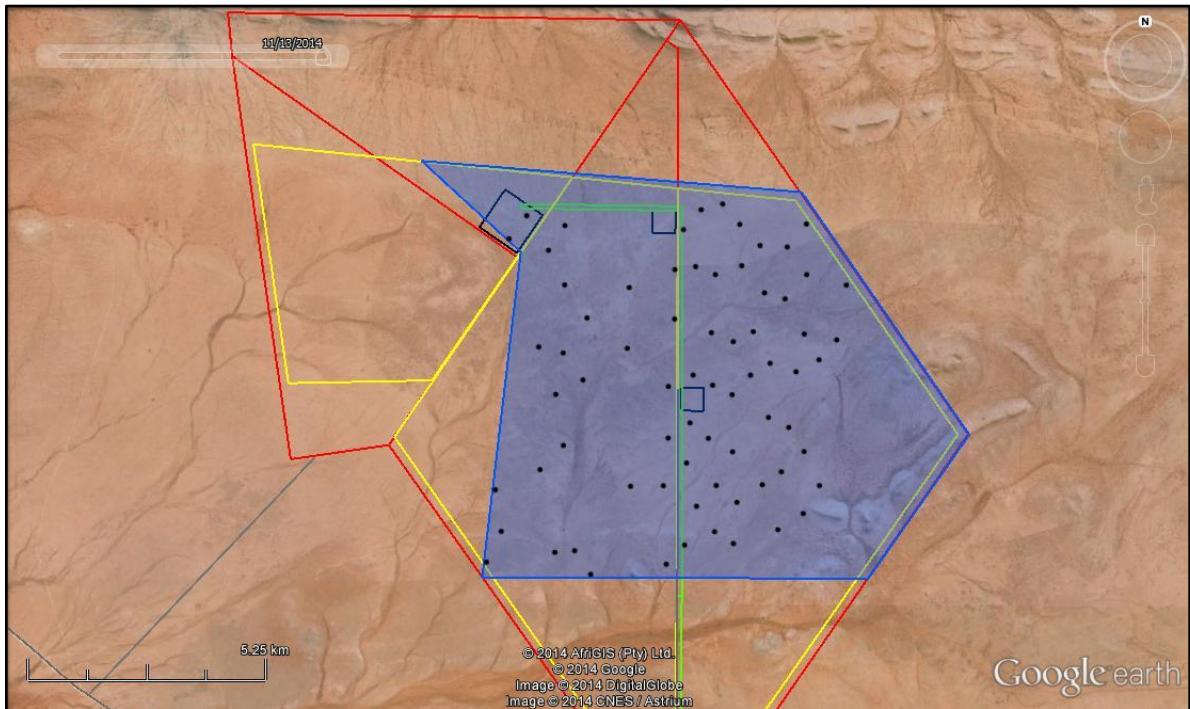


Figure 3: The location of the proposed turbines-black dots, sub-stations black squares and the power lines in green.

2 HERITAGE LEGISLATION

The basis for all HIA is the NHRA, which in turn prescribes the manner in which heritage is assessed and managed. The NHRA 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:

- Any place of cultural significance (described below)
- 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 stipulates that HIAs are required for certain kinds of development such as rezoning of land greater than 10 000 m² in extent or exceeding 3 or more sub-divisions, linear developments in excess of 300 m or for any activity that will alter the character or landscape of a site greater than 5000 m². Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- b) the construction of a bridge or similar structure exceeding 50 m in length;
- c) any development or other activity which will change the character of a site--
 - i) exceeding 5 000 m² in extent; or
 - ii) involving three or more existing erven or subdivisions thereof; or
 - iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- d) the re-zoning of a site exceeding 10 000 m² in extent; or
- e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

2.1 Cultural Landscapes (places of cultural significance)

Section 3(3) of the NHRA, No 25 of 1999 defines the cultural significance of a place or objects with regard to the following criteria:

- (a) its importance in the community or pattern of South Africa's history;
- (b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- (c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- (e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

- (f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- (g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
- (h) 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
- (i) sites of significance relating to the history of slavery in South Africa.

2.2 Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised as a category of heritage resources. Baumann & Winter (2005) comment that the visual intrusion of development on a scenic route should be considered a heritage issue.

2.3 Heritage Grading

A key tool in the assessment of heritage resources is the heritage grading system which uses standard criteria. In the context of an EIA process, heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1). The system is also used internally within Heritage Authorities around the country for making decisions about the future of heritage places, buildings and artefacts.¹ Presently Heritage Western Cape has a good guide to grading which is nationally applicable, on their website (<http://www.westerncape.gov.za/public-entity/heritage-western-cape>).

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

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

Heritage specialists use the grading system to express the relative significance of a heritage resource. This is known as a field grading or a recommended grading. Official grading is done by a special committee of the relevant heritage authority, however heritage authorities rely extensively on field gradings in terms of decision making.

2.4 Heritage authorities

Since the study area will take place in the Northern Cape a provincial heritage authority will be involved – namely Ngwao-Boswa Jwa Kapa Bokone (Northern Cape Heritage Authority). Ngwao-Boswa Jwa Kapa Bokone is assisted by SAHRA on an agency basis as it is a small organisation

¹ http://www.westerncape.gov.za/other/2012/9/grading_guide_&_policy_version_5_app_30_may_2012.pdf

with limited capacity. Heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1).

3 METHODS

3.1.1 Literature survey

A survey of available literature was carried out to assess the general heritage context into which each development was to be set. This literature included published material and unpublished commercial reports. The information gained was used to inform the field survey.

3.2 Field survey

The WEF site was examined through a combination of driving and walking between the 11th and 13th November 2014. During the surveys the positions of finds were recorded on hand-held GPS receivers set to the WGS84 datum.

The survey was done by driving around the site and walking certain areas as appropriate to record heritage resources or conduct sample transects of areas of the landscape. Due to the very large size of the study we identified landscape features that might have attracted prehistoric settlement and examined them.

3.3 Impact assessment

The impact assessment was carried out in terms of the criteria provided by Savannah Pty Ltd.

3.4 Limitations

Apart from the large land area there were no limitations. In general the landscape was substantially uniform such that we could easily identify areas requiring detailed foot survey so the fact that we did not walk the entire layout is not considered to be a significant limitation. Visibility was excellent throughout the study area and archaeological resources are unlikely to have been missed. We have not been provided at this time with road connections between turbines, but this too is unlikely to be a limitation given the scarcity of heritage resources on the landscape.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The site lies on a wide plain to the south of a range of rocky hills known as Die Poort se Berge. A very light covering of vegetation with small bushes and grass tufts exists over most of the area but bare patches are present (Figure 4). Some of these are sandy and due to deflation or perhaps remnant ephemeral pans (Figure 5) but other bare areas are gravel covered and located around quartz surface outcrops. The site is mostly very flat however low ridges or isolated rocky outcrops are encountered from time to time.



Figure 4: View across the study area showing typical environment.



Figure 5: A seasonal waterfilled pan in the study area.

4.1 Archaeology

Although little archaeological research has been conducted in the general area around Pofadder, several impact assessment studies have been conducted in recent years. These form the basis of the present background review. The most useful assessment is that of Orton & Webley (2013) who assessed the adjoining property for the proposed Namies Wind Energy facility.

Early (ESA) and Middle Stone Age (MSA) material, including manufacturing sites, have been found on the northern slopes of the Gamsberg, probably positioned so as to gain easy access to a source of stone material on the mountain. Suitable flaking rock is apparently not easily available on the plains (Morris 2010). Pelsler (2011) reported MSA and Later Stone Age (LSA) material in an area around the Paulputs substation near Pofadder, although his illustrations appear to be of LSA artefacts made on quartz. He also mentions the presence of ostrich eggshell. East of Aggeneys, Webley and Halkett (2012) found a background scatter of predominantly quartz, and some quartzite artefacts. The material is particularly prevalent in those areas where the soil surface is covered in quartz pebbles and cobbles. The size of the artefacts suggests that they

pertain to the Middle Stone Age but diagnostic MSA features were absent. In general, the scatter of stone tools is very widely distributed and does not appear to be concentrated in any specific location.

Orton & Webley (2013) note that the pre-colonial archaeology on the adjoining Namies Wind Energy Facility is sparse and, in common with other surveys in the region, strongly linked to landscape features. Although background scatter artefacts were noted, these were very rare, even more so than expected. This may be due to the lack of suitable flaking rock in the landscape. However, within the turbine layout area stone artefact scatters were located in association with outcrops of ferricrete. These sites likely all date to the Middle Stone Age and comprise extensive scatters of quartz, silcrete, quartzite and ccs (crypto-crystalline silica).

According to Morris (2011a) LSA sites are the predominant archaeological trace noted in surveys in the Aggeneys-Pofadder region, although his survey of the northern slopes of the Gamsberg identified only very few isolated LSA flakes (Morris 2010). However, on the plains below the mountain he did find three LSA settlements. To the northwest of the Gamsberg, he located two stone cairns which could represent graves, as well as a ceramic LSA site. These sites probably represent transient settlement by transhumant hunter-gatherers or herders that moved through the area. Beaumont *et al.* (1995:263) noted that most LSA sites known in Bushmanland at that time, appeared to be ephemeral occupations by small groups of people in the hinterland both north and south of the Orange River. This was in sharp contrast to the substantial herder encampments along the Orange River floodplain itself. Away from the river, LSA material, mainly quartz flakes, appears to often be focused around the base of granite hills (Morris 2011a, b & c; Pelsler 2011; Webley & Halkett 2011). Beaumont (*et al.* 1995) agree and add that red dunes and the margins of seasonal pans also served as foci for LSA occupation.

Orton & Webley (2013) note the presence of bedrock exposures with grinding grooves in several locations throughout the adjoining Namies Wind Energy Facility. Some of these bedrock grooves are found in proximity to water holes in the bedrock (waterbakke).

Rock art is known from the region though Rudner and Rudner (1968) note the scarcity of suitable rock canvases and that art is sparsely distributed through the region. Engravings occur along the Orange River (Morris 1998) where suitable rock exists, while in the rocky areas away from the river there are rare rock paintings. Rudner and Rudner (1968:80-81) described the paintings on the farm Kangnas 60 km to the southwest of Aggeneys but their descriptions were somewhat inaccurate. The sites were re-recorded by Orton and Webley (2012a; Orton 2013). The art is geometric tradition art, a style thought to have been painted by herders. Three sites contain rock art, two in a small ravine and one alongside a large pan. A number of rock engravings, comprised of ground cupules, were recorded by Orton & Webley (2012) at Kangnas and a similar engraving at Namies suggesting a common tradition in this part of the Northern Cape.

Historical accounts of travels through southern Africa frequently provide clues to the pre-colonial occupation of the land. In this case, two travellers, John Barrow and George Thompson, passed through the area and made observations on the local population.

Barrow (1801:387) wrote of the plains between the Kamiesberg Mountains and the Orange River that:

"These plains are now desolate and uninhabited. All those numerous tribes of Namaquas, possessed of vast herds of cattle, are, in the course of less than half a century, dwindled away to four hordes, which are not very numerous, and in a great measure subservient to the Dutch peasantry, who dwell among them."

Thompson (1824:288) noted the following:

"The extensive plains, lying between the Gariiep and the Kamiesberg, are represented, by old writers, as occupied by a numerous races of people, possessed of large flocks and herds,

and living in ease and abundance. Of these, the tribe now resident at Pella and its vicinity, is the only one remaining."

Both texts show that the area was well inhabited in the past but that colonial expansion was taking its toll on the indigenous inhabitants. Nevertheless, these observations suggest that archaeological remains, at least pertaining to the more recent prehistoric period, should be abundant on the landscape.

4.2 History

Two towns and a village lie in an arc to the north of the site. They are Aggeneys, Pofadder and Pella.

The first reference to a farm at Aggeneys/Aggeneis dates to 1872. It became important with the arrival of the Trekboers as the first watering point reached after leaving Springbok. The farm was acquired in 1905 by a former British soldier and the ruins of the original farmhouse are still visible. There was some Boer War action around Aggeneys and the old fortifications can still be seen on the valley sides. The first known investigation of the mineral potential of the area dates to 1928 but the first mining at Swartberg (Black Mountain) dates to the 1970s.

Pofadder was founded as a mission station in 1875 by Reverend Christian Schröder. It was named after a Korana chief, Klaas Pofadder, who was shot by farmers. Colonists began settling around the perennial spring from 1889 but the first residential plots were only surveyed in 1917 (Eksteen 2012).

Pella, to the north and closer to the Orange River, is also a mission station but it was founded much earlier. It was founded by the London Missionary Society in 1814 as a sanctuary for the indigenous people who were driven from Namibia. The mission was abandoned in 1872 because of drought but reopened by the Roman Catholic Church in 1878 (Simon 1959).

The most important historical archaeological resource in the area in the immediate vicinity of the proposed solar facility is the ruined village of Namies and its associated features. The ruined village is located at the foothills of Die Poort se Berg which lies just north of the Poortjie and Namies Wind Farms. The most detailed source of information comes from Mr Barry Eksteen, a local resident and son of a former dominee in the area (Eksteen 2012).

Namies was important as a water supply point for people trekking across Bushmanland as it was the last water before Gamoep, 100 km to the southwest across the open plains. After good rains trekboers used to camp at Namies (Eksteen 2012). There are at least three fountains on the property. When Namies became established is unknown but early maps suggest that it was still relatively unknown in 1858.

During the late 19th century the minister from Garies travelled through Bushmanland each autumn to lead 'Nagmaal' (communion) at Namies (Eksteen 2012). Scully noted that after good rains trekboers from across northern Bushmanland would congregate at Namies and the minister at times preached to several hundred people (Eksteen 2012). At this stage sermons were held in a large tent.

The farms here, including Namies South 212 on which the village was located, were first surveyed in 1895. In 1897 A.J. Dippenaar, who was living at Namies in a tented waggon, wrote to the civil commissioner requesting that land be donated by the government for a church and school. Soon afterwards there was much correspondence regarding the establishment of a town at Pofadder. The need for a church and school was great and a school inspector was dispatched to the region – and his 1905 report was favourable. In July 1906 the surveyor-general sent a surveyor to Namies South to select approximately 500 morgen of land for the church and school. Because the land around the fountain was rocky and bad for grazing, a minimum of 200 morgen was required

(Eksteen 2012). The resulting "school erf" was indicated on a 1908 survey diagram. Although work had not yet started on the school, a teacher was sent to start at Namies in 1910.

Around the same time, permission was also granted for a school to be built at Pofadder (Eksteen 2012). The congregation then moved to Pofadder where a new church was built and consecrated around 1922/1923, although, interestingly, the congregation retained the name of Namies until 1927 when the name Pofadder was adopted. A church booklet provides a photograph of the Namies Church which we must then assume to have been in existence before the decision was taken to move the congregation to Pofadder.

It is apparent from the above history that the village of Namies, although being relatively short-lived, played a key role in the development of the region. It was for many years a central gathering point for trekboers from Namaqualand and Bushmanland and eventually the first Dutch Reformed Church congregation for the local region was established here. Only in the mid-20th century did the area fall from favour with the still relatively new town of Pofadder taking over the primary role. The ruins of the church and at least 20 mud brick structures and stone kraals remain of the old settlement (Orton & Webley 2013). The boarding school is still in relatively good condition and is used for storage. There are at least two graveyards associated with the settlement; the fenced graveyard contains 14 burials while the unfenced graveyard (which is situated next to the gravel farm road) contains at least 24 graves.

4.3 Cultural Landscape

The potential importance of the Gamsberg as a likely massacre site of Bushmen groups during the 19th century is discussed by Morris (2010 & 2013). This has resulted in discussions around including the Gamsberg in a potential /Xam and Khomani Heartland World Heritage Site.

5 FINDINGS

Appendix A contains an inventory of finds. Figure 6 shows the location of finds and a log of search patterns.

5.1 Stone Age archaeology

No clearly definable archaeological sites were recorded. Even the few foci that there were on the landscape failed to attract any form of stable pre-colonial occupation. The typical archaeology of the site is limited to a diffuse litter of stone artefacts, most of which were informal. Natural occurrences of quartz and crystal quartz showed limited flaking or harvesting for raw materials. There is a slight tendency for artefacts to be more visible on the edges of seasonal pans, but again not in concentrations dense enough to be described as archaeological sites.

5.2 Built environment

No elements of the built environment were located on the Khai-ma site.

5.3 Cultural landscape, sense of place, visual impacts

Given that the farm was only granted in the early 20th century and that all the structures date to this time and later, there are few, if any, cultural landscape elements of concern. The site is very remote and has a distinct sense of place. This pertains to the vast open spaces of Bushmanland which stretch as far as one can see without man-made interruptions. Visual impacts will be high but due to the remoteness of the area, there are very few visual receptors. The R358 has scenic qualities but, being a gravel road, carries far less traffic. It lies some 13 km to the east.

The N14 lies some 21 km to the north of the WEF site and is the only route that can be regarded as a significant scenic route through the area. To the north the site is completely screened from

the N14 by the intervening low mountains and from the west it is too distant from the N14 to result in an impact.

The R358 is has scenic qualities but, being a gravel road, carries far less traffic. It lies some 13 km to the east.

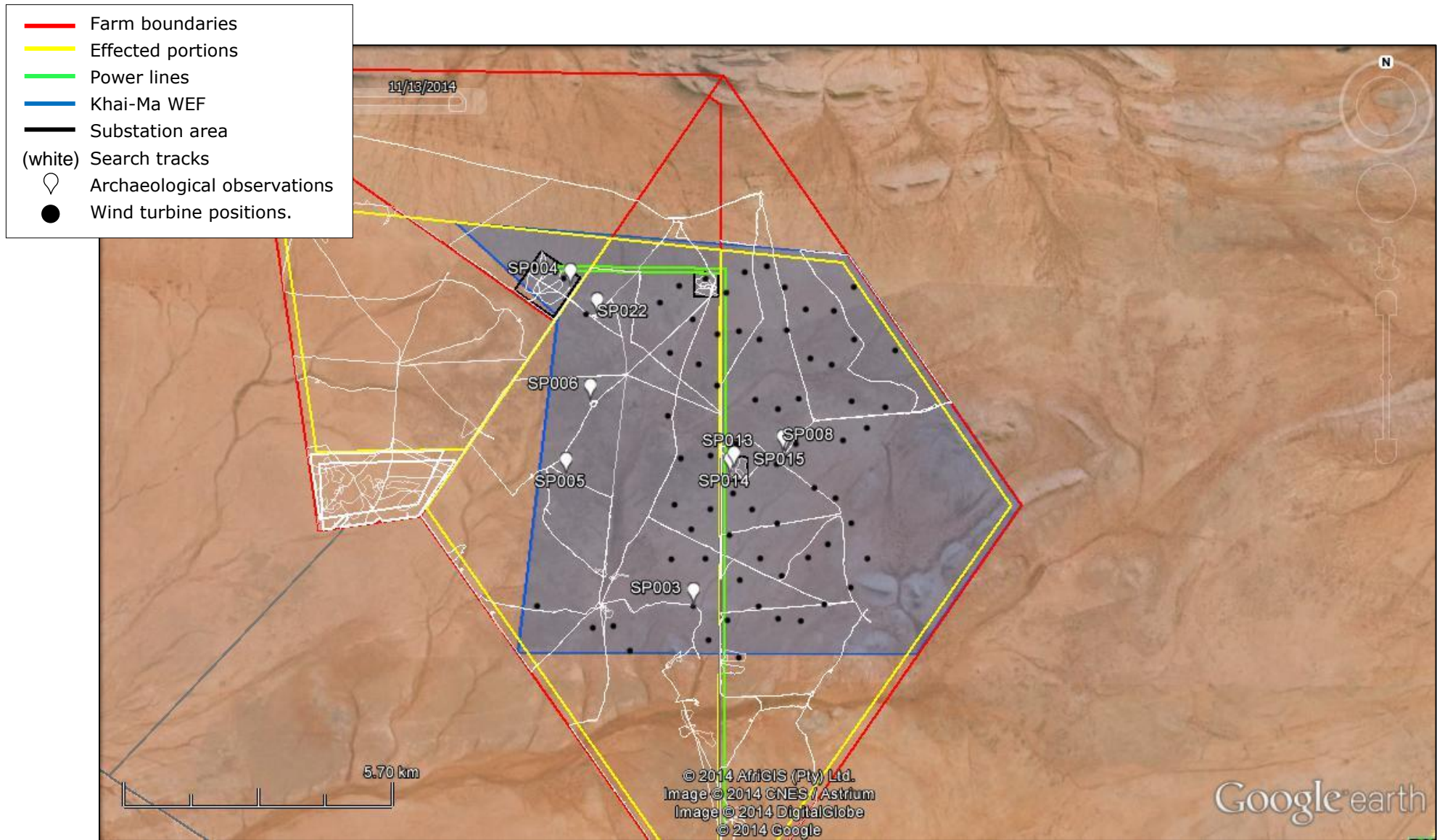


Figure 6. Map of the Khai-Ma proposed wind energy facilities indicating search paths and denser archaeological occurrences.

6 Potential Impacts Associated With Wind Energy Facilities.

Wind energy facilities are big developments that can produce a wide range of impacts that will affect the heritage qualities of an area. Each turbine site needs road access that can be negotiated by a heavy lift crane(s) which means that in undulating topography deep cuttings and contoured roads will have to be cut into the landscape to create workable gradients. During the construction phase each of the turbine sites will have to be leveled off to create a solid platform for cranes as well as a lay-down area for materials. This will involve earthmoving and road construction, followed by the bringing in of materials and plant. The actual construction of the turbines will involve excavation into the land surface to a depth of 3 m and over an area of 400 m² for the concrete base. The pre-fabricated steel tower is bolted on to the base and erected in segments. The nacelle containing the generator is finally attached followed by the rotors. The turbines are connected to underground cables to a sub-station(s) (positions to be determined) where after the generated current will be fed to the national grid via transmission lines.

6.1 Impacts expected during the construction phase of the wind energy facility

During the construction phase the following physical impacts to the landscape and any heritage that lies on it can be expected:

- Bulldozing of roads to turbines sites with a possibility of cut and fill operations in places;
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine site;
- Excavation of foundations for each tower;
- Excavation of many kilometers of linear trenches for cables;
- Erection of a 132 kV power line (pole design or route not finalized);
- Construction of electrical infra-structure in the form of one or more sub-stations.

In terms of impacts to heritage, archaeological sites which are highly context sensitive are most vulnerable to the alteration of the land surface. The best way to manage impacts to archaeological material is to avoid impacting them. This means micro-adjusting turbine positions where feasible, or routing access roads around sensitive areas. If primary avoidance of the heritage resource is not possible, then some degree of mitigation can be achieved by systematically removing the archaeological material from the landscape. This is generally considered a second best approach as the process that has to be used is exacting and time-consuming, and therefore expensive. Furthermore the NHRA requires that archaeological material is stored indefinitely which has cost implications and places an undue burden on the limited museum storage space available in the province.

Although indications are that impacts to archaeological material are likely to be of low significance, it must be noted that it has not been possible to assess the potential impacts of road construction on archaeological sites. Furthermore, turbine positions provided are preliminary.

It is recommended that the following mitigation measures are implemented.

- Existing farm tracks be re-used or upgraded to minimise the amount of change to un-transformed landscape;
- During the detailed planning phase, drawings of proposed road alignments, infrastructure and near-final turbine positions should be submitted to an archaeologist for review and field-proofing. Micro-adjustment of alignments and turbine positions is likely to be sufficient to achieve adequate mitigation.

6.2 Impacts expected during operation of the wind energy facility

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project,

impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. The point at which a wind turbine may be perceived as being "intrusive" from a given visual reference point is a subjective judgment, however it can be anticipated that the presence of such facilities close to (for example) wilderness and heritage areas will destroy many of the intangible and aesthetic qualities for which an area is valued. The fact that turbines are continuously revolving results in a visual impact that can be very disturbing and destructive to the sense of serenity of a place.

- Due to the size of the turbines the visual impacts are largely not easily mitigated (they are easily visible from 10 km) in virtually all landscapes (personal observations), however indications are (PGWC, 2006) that they are perceived to aesthetically/artistically more acceptable in agricultural or manicured landscapes;
- The fact that the turbines are in continuous motion creates a visual impact more severe than that caused by static objects and buildings;
- Shadow flicker – an impact particular to wind turbines, comprises very large moving shadows created by the giant blades when the sun is low on the horizon. Such shadows can extend considerable distances from the turbine. Continuous shadow flicker will have a serious impact on the sense of place of a heritage site;
- Residual impacts can occur after the cessation of operations. The large concrete turbine bases will remain buried in the ground indefinitely. Bankruptcy or neglect by a wind energy company can result in turbines standing derelict for years creating a long term eyesore.

While it is not expected that physical impacts will result, changes to the way in which the area is used by people can result in impacts. If the intangible qualities of a place are affected in such a way that it becomes an undesirable place to visit or reside, the sustainable use of the buildings will diminish. There is merit in making sure that no structures are affected by shadow flicker or noise which may result in them being uninhabitable.

Not implementing the proposal will result in no impacts to heritage, apart from those impacts caused by natural forces such as erosion, weathering and natural decay.

7 Assessment Of Impacts

The proposed development site is not sensitive in terms of archaeological material or built environment. Impacts are of low significance. The only exception is the archaeological signature of the village of Namies through which the existing access road passes. Widening of the road could result in impacts.

7.1 Archaeological material - WEF

The study area is not archaeologically sensitive therefore rescue excavations of archaeological material will not be necessary for any development of the site, power line routes or substation sites. Generally the impact of the proposed activity on archaeological material is very low.

7.1.1 Nature of impacts

The main cause of impacts to archaeological sites 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. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. In the case of the proposed activity the main source of impact is likely to be the construction of access roads, lay-down areas and excavation of the footings the turbines.

7.1.2 Extent of impacts

It is expected that impacts will be limited (local) There is a chance that the deep excavations for bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface sand. Potential impacts caused by power line and proposed access roads are similarly likely to be limited and local. The physical survey of the study area has shown that surface archaeological material is insignificant and dispersed, which means that the extent of impacts is likely to be highly localised (if at all) with no regional implications for heritage of this kind.

7.1.3 Significance of impacts

In terms of the information that has been collected, indications are that impacts to pre-colonial archaeological material will be limited. In terms of buried archaeological material, one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be negligible.

7.1.4 Status of impacts

The destruction of archaeological material is usually considered to be negative; however opportunities for the advancement of science and knowledge about a place can result provided that professional assessments and mitigation is carried out in the event of an unexpected find. In this case there is so little material on site that there will be no opportunity to benefit therefore the impact will be neutral – low negative.

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (1)	Low (1)
Probability	Possible (2)	Possible (2)
Significance	Low (14)	Low (14)
Status	Neutral	Neutral
Reversibility	Low reversibility	Low reversibility
Irreplaceable loss of resources?	No	No
Mitigation:	No mitigation required prior to construction.	
Cumulative impacts:	n/a.	
Residual Impact:	n/a	

7.2 Colonial period heritage

Colonial period heritage – that is buildings and historical sites of significance have not been identified within the boundaries of the study area. The only area of concern is the proposed access road from the N14 which passes through the old Namies Village area. This impact can be avoided by diverting the road to the south (as proposed) or using either of the alternative routes in from the south.

7.2.1 Nature of impacts

Historic structures are sensitive to physical damage such as demolition as well as neglect. They are also context sensitive, in that changes to the surrounding landscape will affect their significance.

7.2.2 Extent of Impacts

Direct or indirect impacts are not expected.

7.2.3 Significance of impacts

Given that there are no structures or historical sites within the study area, the significance of any impacts is very low.

7.2.4 Status of impacts

Within the boundaries of the proposed wind energy facility, impacts are considered improbable. The overall status is considered to be neutral

Table 3: Summary of impacts on colonial period heritage .		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Temporary (1)	Temporary (1)
Magnitude	Low (1)	Low (1)
Probability	improbable (1)	Improbable (1)
Significance	Very low (3)	Very low (3)
Status	Neutral	Neutral
Reversibility	n/a	n/a
Irreplaceable loss of resources?	No	No
Mitigation:	n/a	
Cumulative impacts:	No cumulative impacts	
Residual Impact:	n/a	

7.3 Cultural landscape and sense of place

7.3.1 Nature of impacts

Cultural landscapes are highly sensitive to cumulative impacts and large scale development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value, aesthetic and scientific significance. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region. Given the fact that this particular landscape is of limited aesthetic value, not particularly rare and extremely isolated the significance of the landscape impact is moderated.

7.3.2 Extent of impacts

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. The impact of the proposed activity will be local but with a likely contribution to cumulative impacts.

7.3.3 Significance of impacts

The impact of the proposed activity is medium.

7.3.4 Status of impacts

The status of the impact is negative (without mitigation).

Table 4: Summary of Impacts on Cultural Landscape		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (5)	Medium (5)
Probability	Likely (3)	Likely (3)
Significance	Medium (33)_	Medium (33)
Status	Negative	Negative
Reversibility	Reversible after closure of facility	Reversible after closure of Facility.
Irreplaceable loss of resources?	No	No
Mitigation: None possible		
Cumulative impacts: This development together with the proposed 2 wind energy facilities and the solar facility will create a local industrial enclave which will be further reinforced by the nearby proposed Namies Wind Farm. The aesthetic qualities of the study area will irrevocably change. This has the possibility of changing the regional identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which could sterilise future tourism growth potential.		
Residual Impact: n/a		

7.4 Transmission lines

Neither the proposed internal power line routes nor the proposed 400 kV line to the Aggeneys substation are likely to cause negative impacts to cultural heritage. The study area is extremely sparse in terms of both archaeological and historical material/sites.

Table 5: Summary of Impacts on Heritage		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (1)	Low (1)
Probability	Possible(2)	Possible (2)
Significance	Low (12)_	Low (12)
Status	Neutral	Neutral
Reversibility	Reversible after closure of facility	Reversible after closure of facility.
Irreplaceable loss of resources?	No	No
Mitigation: A no-development buffer zone of a radius of 500m must be implemented around Boorwater Farm and the Namies School building.		
Cumulative impacts: This development together with the proposed 2 wind energy facilities and a solar facility will create a local industrial enclave which will be further reinforced by the nearby proposed Namies Wind Farm. The aesthetic qualities of the study area will irrevocably change. This has the possibility of changing the regional identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which could sterilise future tourism growth potential. There is already an existing Eskom 400 kV line in the study area so an additional line will contribute further to industrial clutter, especially along the N14 stretch to the Aggeneys sub-station.		
Residual Impact: n/a		

7.5 Access routes

Table 6: Summary of Impacts on heritage		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long term (5)	Long term (4)
Magnitude	Medium (3)	Low (1)
Probability	Likely (4)	Possible (2)
Significance	High (32)	Low (12)
Status	Negative	Neutral
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	No
Mitigation: Avoid Namies by moving the access road to the south of the village site. Use of the alternative or the second alternative access road is supported.		
Cumulative impacts: This development together with the proposed other renewable energy facilities will create a local industrial enclave which will be further reinforced by the nearby proposed Namies Wind Farm. The aesthetic qualities of the study area will irrevocably change. This has the possibility of changing the regional identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which could sterilise future tourism growth potential. Increasing the road infrastructure will further impact the wilderness qualities of the area and impact the sense of isolation of this region. The ruins of the village of Namies is a unique archaeological site which highly sensitive to physical impacts.		
Residual Impact: n/a		

7.6 Comparison of alternatives

7.6.1 Access Roads Associated with Power Line Alternatives

Existing road: The existing west-east access road from the N14 passes very close to the historic site of Namies. Widening or changing the alignment of this road could result in impacts to graves and ruins at the settlement. If this route is selected, extensive mitigation in terms of recording, rescue archaeology and grave relocation may be required. Moving the route south of Namies as proposed would be adequate mitigation.

Alternatives:

- The second alternative is preferred as there is an existing road in the area that could be upgraded and minimise the loss of natural landscape.
- The alternative route is an acceptable but intermediary choice.
- The existing route is least preferred due to the potential impacts that road widening and re-alignment will have on the Namies village archaeological site (Figure 7). However if the proposed alignment south of Namies is implemented, impacts will be avoided and the route would be acceptable.

7.6.2 Substations

All the proposed substations sites are acceptable. No preference is submitted.

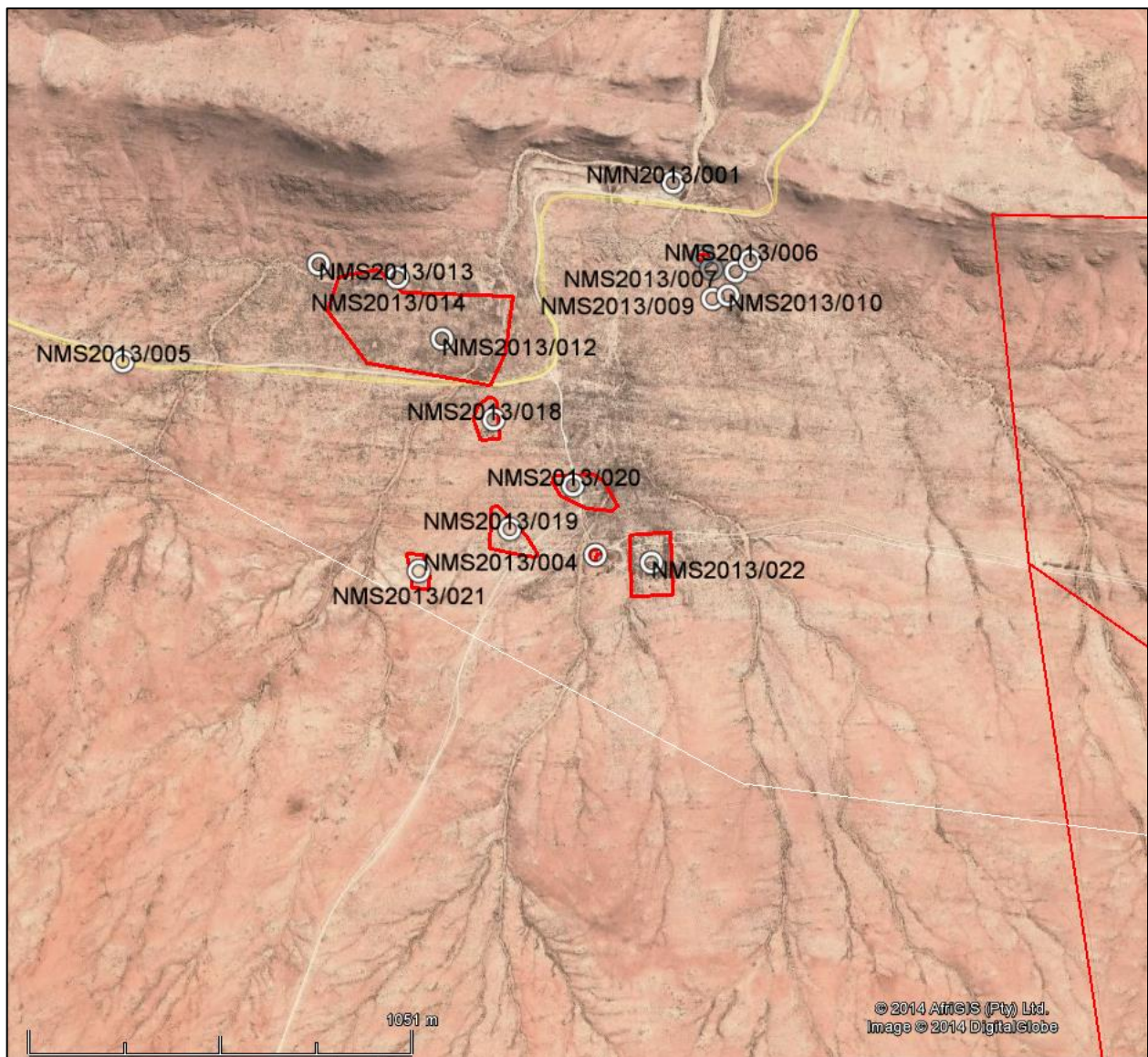


Figure 7 Sensitive heritage areas associated with Namies village and the existing access road. The proposed route south of Namies will avoid these (after Webley and Orton 2013).

7.6.3 The no-go alternative

The no-go alternative will result in retention of the status-quo in heritage terms.

8 CUMULATIVE IMPACTS.

The Mainstream proposals combined will see the construction of up to 210 turbines, which in itself is a large concentration that will have a powerful effect on the sense of place. This combined with the solar proposal, substations and transmission lines will effectively transform a natural and largely wilderness environment into an industrial enclave. The proposed Namies wind energy facility that lies a few kilometres to the west and further solar and wind facilities in the Aggeney's area create a combined chain of industrial development some 75 km in length excluding roughly an 18 km radius that will be affected by visual impacts. This is a massive development which in terms of area is the size of a large city.

The cumulative impact will negatively affect the landscape qualities of the area which are generally considered to be significantly scenic. This has the possibility of changing the regional

identity of the Province at large due to the high frequency of similar proposals in the area. The sense of isolation and wilderness will be effected which negatively affect future tourism growth potential (<https://dea.maps.arcgis.com/apps/webappviewer/index.html?id=b8452ef22aeb4522953f1fb10e6dc79e>).

The accumulative impact is of high significance, in terms of the impact to character and quality of the landscape. It effect will in time alter the regional identity.

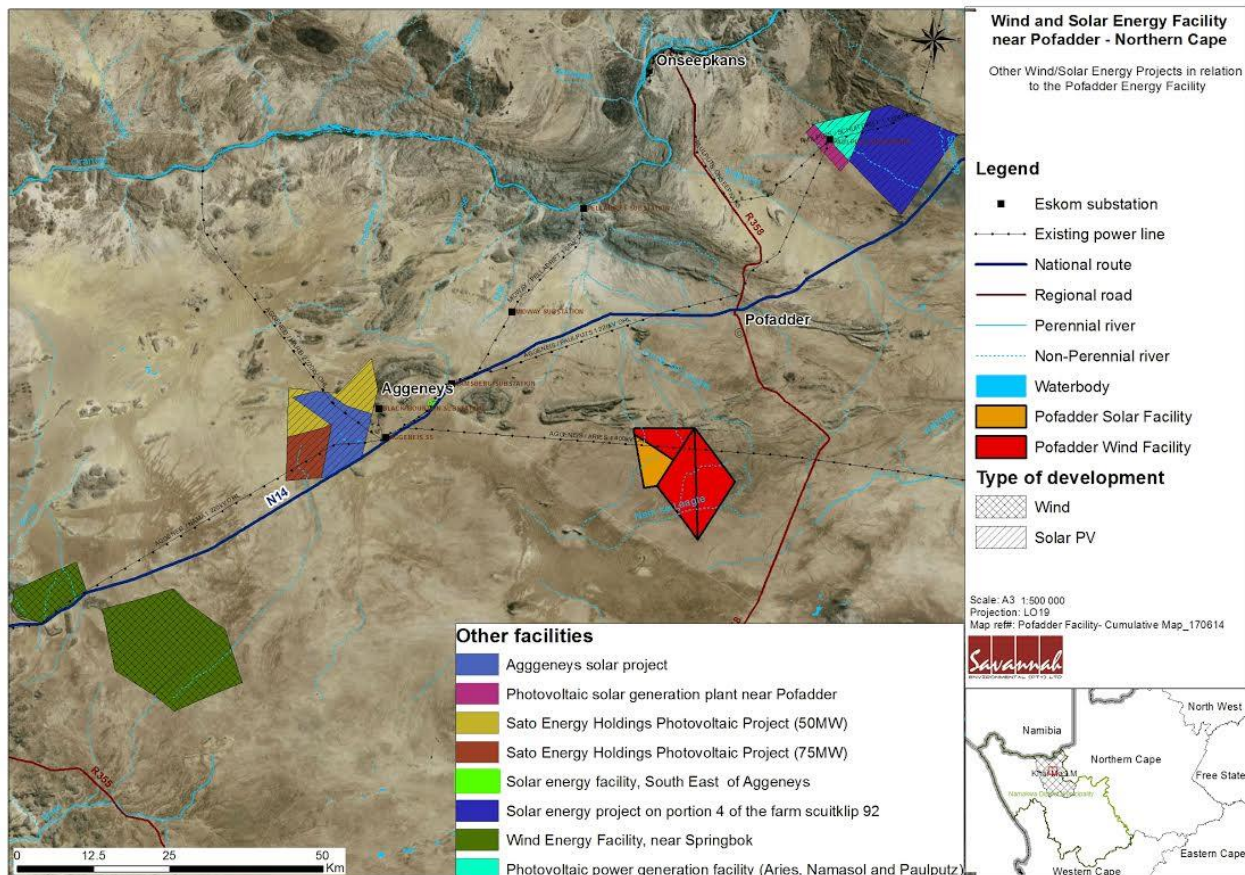


Figure 8: Wind and Solar energy facilities near Pofadder

9 MITIGATION AND CONSERVATION

9.1 Archaeological and palaeontological heritage

There is no surface archaeological material that requires any form of mitigation prior to construction work.

9.2 Built environment and colonial period sites

There are no protected sites or structures within the study area that require mitigation. The access road which passes through the site of the village of Namies will result in impacts if widened. The diversion of the route to the south as proposed is supported, as is the use of the alternative or second alternative access road.

9.3 Cultural landscape

No mitigation measures are suggested.

9.4 Human remains

Human remains can occur at any place on the landscape. They are regularly exposed during construction activities along the west and south coasts. Such remains are protected by a plethora of legislation including the Human Tissues Act (Act No 65 of 1983), the Exhumation Ordinance of 1980 and the National Heritage Resources Act (Act No 25 of 1999). In the event of human bones being found on site, SAHRA must be informed immediately and the remains removed under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work.

10 CONCLUSION

Given the generally low sensitivity of the study area, the proposed activity is acceptable. The area of concern is the proposed access road from the N14 .

The current access road passes through the middle of the ruined village of Namies. This area is of concern because there are components of the village (buildings and graves) that are located very close to the roads and could be impacted by any road widening. Here depending on how the access road is designed, mitigation may be required. Realigning this road south of Namies as proposed would be an acceptable solution, as would choosing one of the alternative or second alternative alignments.

10.1 Management

Project component/s	<ul style="list-style-type: none"> • Turbine construction involves a large excavation for the counterweight foundations. • Overhead and below surface power lines. • Substation(s) construction • An overhead power line to connect the facility to the electricity grid • Internal access roads • Workshop area/office for maintenance • Construction of access road.
Potential Impact	No impacts expected, avoid impacts to ruins and graves at Namies.
Activity/risk source	Widening of existing access road.
Mitigation: Target/Objective	Ensure that Namies is avoided by routing road to south of Namies village ruins. No mitigation is deemed necessary, other than to observe heritage law and report un-anticipated finds.

Mitigation action/control	Responsibility	Timeframe
Check final selected access route with heritage consultant, design mitigation if necessary.	Proponent and project archaeologist.	In planning stages before construction commences.

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Appendix A: Archaeological occurrences found on the Khai-Ma WEF.

No.	Description	East	South
SP003	Pan – low density quartz and a handful of quartzite flakes	19.3164	-29.3979
SP004 SP005	1 large quartz irregular core and quartz (large) flakes also 1 quartz MSA flake	19.2896	-29.3372
SP006	Small (very few pieces) scatter of quartz on edge of pan. Core and flakes (± 8 pieces)	19.2886	-29.3731
SP008	Martini Henry cartridge case. Thin sheet brass with seam. Old type pre 1880	19.2830	-29.3545
SP013	Low density quartz scatter amongst and around outcropping bedrock – very low density. 1 small biface of quartzite.	19.2497	-29.3248
SP014	Small scatter of quartz (flakes and a core) not associated with a pan. Lots of surface quartz.	19.3252	-29.3719
SP015	Artefact?	19.3244	-29.3730