

# **ARCHAEOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED BOULDERS WIND FARM, VREDENBURG PENINSULA, WESTERN CAPE**

**HWC CASE:** 18022002SB0314E

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

Prepared for

Vredenburg Windfarm (Pty) Ltd.

June 2018



Prepared by

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Revised August 2019

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## **EXECUTIVE SUMMARY**

### **Introduction**

ACO Associates CC have been appointed by Vredenburg Wind Farm (Pty) Ltd to undertake an Archaeological impact assessment, as part of the EIA process, for the establishment of a wind energy facility on land at the northern end of the Vredenburg Peninsula between the towns of Vredenburg, Paternoster and St Helena Bay to be known as the Boulders Wind Farm. This impact assessment study considers the development of a wind farm with a contracted capacity of up to 140MW which will include the construction and operation of up to 45 wind turbines.

### **Methodology**

This Archaeological Impact Assessment has been commissioned as part of a Heritage Impact Assessment that attempts to predict the possible range of impacts on physical heritage resources and identify any issues in terms of accumulated knowledge of the area. This report considers the archaeology of the area and is compiled as part of a broader HIA undertaken by Ms Katie Smuts. The study is primarily informed by results of field studies undertaken by Halkett and Webley between 12 - 21 October 2011 and 2 February 2015 in addition to the comprehensive field survey of the area undertaken by Sadr (et al 1992). Other sources of information consist of published archaeological research reports and unpublished archaeological and palaeontological heritage impact assessments for the general area, as well as a good working knowledge of the site and surroundings. As there is a wealth of studies of both archaeology and palaeontology available (see the extensive bibliography), the identification of heritage indicators is well informed. Where relevant, specific reference to certain documents has been made in the text. No archaeological material was removed from the project area, but rather recorded and photographed *in situ*. Affected landowners were also consulted with regard to knowledge of heritage resources on their properties.

### **Summary**

During the scoping study archaeological sites and buffer zones were identified and made known to the proponent through sensitivity mapping. The proponent has gone to some length to plan the layout of the facility in such a way as to acknowledge the archaeological sensitivities of the area. While we have identified a few archaeological sites artefact/marine, shell scatters within the project area, these have been generally avoided by the facility layout (or/and are of low significance). Where there are complexes of archaeological sites, they have been identified as areas generally not suitable for development/no-go areas within the project site.

The turbine and infrastructure layout has taken cognisance of all buffers and no-go areas as per the findings of the scoping report.

### **Conclusion**

The current site layout has come about as a result of good information fed into the planning process in the early stages of the project. The result is that impacts to archaeological heritage and historic sites are not expected. The project is therefore considered acceptable from an archaeological perspective and can be authorised, subject to the implementation of the recommended mitigation measures included in this report. No unacceptable loss is expected to occur.

### **Mitigation**

- Extensive sensitivity mapping by the heritage specialist has gone a long way towards mitigating impacts on the site through avoidance of the sensitive features, and no major mitigation of physical heritage resources is anticipated for the project. No stratified contexts were recognised;

- The Lombard and Pienaar cemetery (2011\_329 at s32.80442800 e18.00421500) has been identified as a “no-go” area. As the existing farm road that passes the cemetery site will be upgraded as an access road during turbine construction we have suggested that the alignment is modified and that the road should be shifted moderately to the west (as indicated by the white alignment on Figure 7) to avoid any possible impact on the cemetery. During the construction phase, the cemetery must be identified by hazard tape and avoided;
- Avoidance and conservation of significant heritage resources is through buffers, no-go areas around farm buildings and graveyards, archaeological sites or complexes and has largely already been achieved in the proposed layout assessed in the archaeological impact assessment;
- Accidentally discovered archaeological material must be reported to the Provincial Heritage Authority in terms of section 35 of the National Heritage Resources Act. The finds should also be reported to the appointed archaeologist for assessment and possible action;
- Accidentally discovered human remains must immediately be reported to the Provincial Heritage Authority in terms of section 36 of the National Heritage Resources Act. The finds should also be reported to the appointed archaeologist for assessment and possible action;
- The ECO should be informed of any accidental finds.
- Some monitoring of the construction activities by the archaeologist is required to determine the effectiveness of the mitigation. This will be at earthmoving stage to ensure that there are not significant buried archaeological resources being exposed.

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## **DETAILS OF THE SPECIALIST**

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ID number: 5807235148080

Date of Birth: 23.07.1958

Company: ACO Associates cc (Registration 2008/234490/23)

Principal business: Archaeological/Heritage Impact Assessment

Position: Director (Principal investigator)

Profession: Archaeologist, Heritage Impact Assessor

Years with Firm: 8

Years' experience: 27

Previous employment: Archaeology Contracts Office, UCT, 24 years

Nationality: South African

HDI Status: White Male

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## **EXPERTISE OF THE SPECIALIST**

Having co-directed the Archaeology Contracts Office at the University of Cape Town for 24 years (one of the first heritage resource management companies in South Africa), David is now a director of ACO Associates cc, which has taken over from the UCT operation and retains most of its staff. ACO Associates provides Heritage and Archaeological Impact Assessment services to a range of clients in order for them to comply with Environmental and Heritage Legislation. He is a long standing member of the Association of Southern African Professional Archaeologists (ASAPA) and an accredited Principal Investigator of the Cultural Resource Management (CRM) section. With 30 years of working experience in heritage impact assessments, conservation and archaeological research, he has worked in a wide variety of contexts and participated in over a thousand heritage projects ranging from Heritage and archaeological impact assessments, to mitigation of archaeological sites in suburban, rural and industrial (mining) situations. He is an accredited with ASAPA to act as a Principal Investigator on Earlier Middle and Later Stone Age sites, especially coastal shell middens and rock painting sites, and Colonial period sites. David's broad experience in heritage management has led to his participation as an advisor to the National Monuments Council up until 2000, and more recently he served as a member of two Heritage Western Cape regulatory committees, the Impact Assessment Review Committee (IACOM) and the Archaeology, Palaeontology and Meteorites Committee (APM), and he has served on occasion as a forensic consultant to the Missing Persons Unit of the National Prosecuting Authority (NPA). He has led field projects on behalf of both local and overseas research organisations, and continues to participate in archaeological research on an ad hoc basis. Research interests include aspects of the Middle Stone Age, Later Stone Age and Colonial era of southern Africa. He has co-authored a number of peer reviewed journal articles on these topics. ACO Associates cc has assisted on numerous renewable energy projects in the Northern, Eastern and Western Cape and David has been personally involved in a number of these projects.

### **Education:**

1991: M.A. (Archaeology) University of Cape Town

1982: B.A. (Hons) (Archaeology) University of Cape Town

1980: B.A. University of Cape Town

1976: Pinelands High School (matric exemption)

### **Professional Qualifications:**

MA (Archaeology) UCT

Registered member of the Association of Southern African Professional Archaeologists (ASAPA)

### **Languages:**

First language – English  
Second language - Afrikaans (speaking, reading and writing).

### **Summary of other experience:**

2008-present: Director and Principal Investigator: ACO Associates cc. Projects undertaken in the Eastern, Northern and Western Cape Provinces.

1988-2012: Principal Investigator and director: Archaeology Contracts Office, University of Cape Town. Projects undertaken in the Eastern, Northern and Western Cape Provinces.

1997: Junior Research Officer: Palaeoanthropology Research Unit, University of the Witwatersrand, (part time apt for one year) Cape Town based.

1984: Part time research assistant: Spatial Archaeology Research Unit, University of Cape Town

### **Relevant experience:**

Employment since 1988 has required management of all aspects of heritage projects, and management of the day to day functions of the business (including Financial, HR).

### **Participation in selected Wind and Solar RE projects**

Halkett, D. 2001. An assessment of impacts on heritage sites at the Darling Demonstration Wind farm. Unpublished report for the Environmental Evaluation Unit, University of Cape Town. University of Cape Town: Archaeology Contracts Office.

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Halkett, D 2014. Review study of proposed G7 Richertsveld Wind Energy Facility. Prepared for CapeEaprac. ACO Associates cc.

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Webley, L. & Halkett, D. 2014. Archaeological Impact Assessment: proposed construction of Re Capital 13 PV on the remainder of the farm Humansrus 147 near Copperton, Northern Cape. Unpublished report prepared for Perception Planning on behalf of Cape Eaprac. ACO Associates cc.

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## **Books**

Malan, A. Halkett, D., Hart T., Schietecatte, L. 2017. *Grave Encounters. Archaeology of Burial grounds*. Green Point, South Africa. Project funded by the National Lotteries Board. Published by ACO Associates.

**SPECIALIST DECLARATION**

**Declaration of independence**

I, David J Halkett declare that :

I act as the independent specialist in this application;

I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

I declare that there are no circumstances that may compromise my objectivity in performing such work;

I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

I will comply with the Act, Regulations and all other applicable legislation;

I have no, and will not engage in, conflicting interests in the undertaking of the activity;

I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

all the particulars furnished by me in this form are true and correct;

and

I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act



\_\_\_\_\_  
Signature of the specialist:

ACO Associates CC

\_\_\_\_\_  
Name of company (if applicable):

14 June 2018

\_\_\_\_\_  
Date:

## GLOSSARY

**Archaeology:** Remains resulting from human activity which is 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 (ESA):** 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);

**HWC:** Heritage Western Cape – the Provincial Heritage Resources Authority;

**Late Stone Age (LSA):** The archaeology of the last 20 000 years associated with fully modern people;

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

**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;

**SAHRA:** South African Heritage Resources Agency – the National heritage compliance authority;

**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. Generally protected structures are those which are over 60 years old.

## ACRONYMS

AIA	Archaeological Impact Assessment
DEA	Department of Environmental Affairs
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
ESA	Early Stone Age
HIA	Heritage Impact Assessment
LSA	Late Stone Age
MSA	Middle Stone Age
NGO	Non-government organisation
NHRA	National Heritage Resources Act
PV	Photovoltaic (solar energy)
PVSEF	Photovoltaic solar energy facility
RE	Renewable energy
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
WEF	Wind Energy Facility

# 1. SCOPE AND PURPOSE OF THE REPORT

## 1.1 Introduction

ACO Associates CC have been appointed by Vredenburg Windfarm (Pty) Ltd to undertake an Archaeological Impact Assessment, as part of the EIA process, for the establishment of a wind energy facility on land at the northern end of the Vredenburg Peninsula between the towns of Vredenburg, Paternoster and St Helena Bay, in the Western Cape Province.

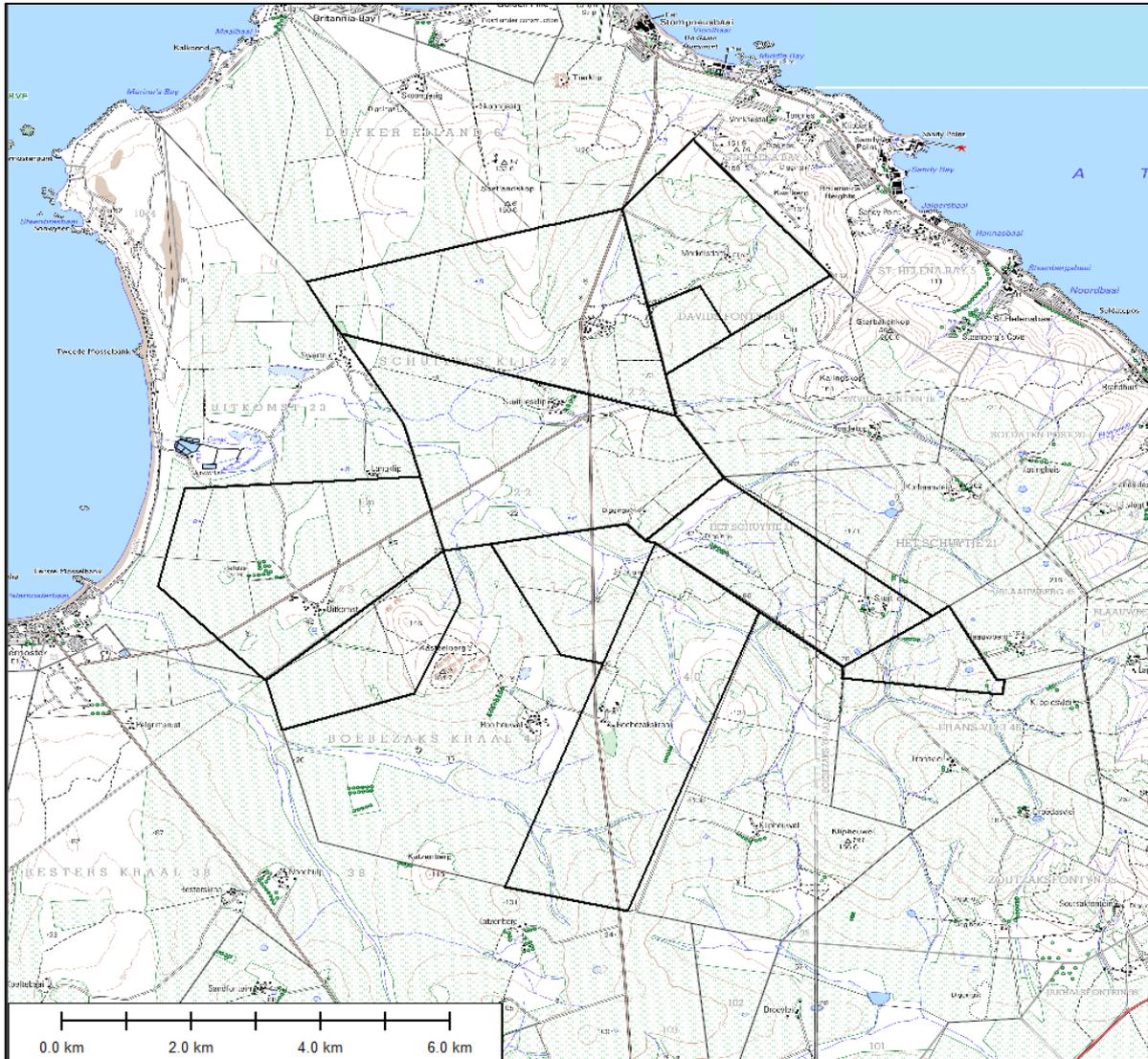


Figure 1: The location of the proposed wind farm (black polygons) situated on the northern end of the Vredenburg Peninsula. 3217DB&DD Vredenburg, 3218CA&CC Velddrif. (Chief Director Surveys And Mapping)



Figure 2: The affected farm portions shown in regional context.

### **1.1.1 Background**

#### **1.1.1.1 Project history**

The current project is a fresh initiative and a new application for Environmental Authorisation to develop the Boulders Wind Farm within the identified project site.

### **1.2 Proposed site**

The site lies at the northern end of the Vredenburg Peninsula between the towns of Vredenburg Paternoster and St Helena Bay (Figures 1 and 2).

#### **1.2.1 Applicant**

Vredenburg Windfarm Pty (Ltd)

#### **1.2.2 Project Name**

Boulders Wind Farm

#### **1.2.3 Proposed Activity and location**

Development of a Wind Energy Facility with a contracted capacity of up to 140MW and up to 45 wind turbines is proposed to be constructed and operated within a project site identified by the developer. The project site under consideration for the development of the Boulders Wind Farm consists of 10 properties which includes:

- » Boebezaks Kraal 2/40
- » Boebezaks Kraal 3/40
- » Boebezaks Kraal 5/40
- » Frans Vlei 2/46
- » Schuitjes Klip 3/22
- » Davids Fontyn 9/18
- » Schuitjes Klip 1/22
- » Het Schuytje 1/21
- » Davids Fontyn 7/18
- » Uitkomst RE/6/23

## **2. DATE AND SEASON OF THE SITE INVESTIGATION**

This AIA was completed in June 2018. The report is informed by results of field studies undertaken by Halkett and Webley between 12 - 21 October 2011 and 2 February 2015 in addition to the comprehensive academic survey of the area undertaken by Sadr et al 1992. To date some 8 days have been spent on site. For the most part during ACO visits, access to fields and good surface visibility was available although there were some areas which still under crops, which are not believed to influence the conclusions substantially. We have no information with respect to the seasonal timing of initial surveys of the Vredenburg Peninsula by Sadr et al (1992). Apart from the wheat growing season, archaeological visibility is generally good all-year round.

Refer to Figure 3 below for a map of the layout which was assessed as part of this archaeological impact assessment.

## **3. METHODOLOGY**

### **3.1 Project scope**

This study has been commissioned as an archaeological impact assessment which identifies the possible range of impacts on archaeological resources and any associated issues in terms of accumulated knowledge of the area. The sources of information consist primarily of published archaeological research reports and unpublished archaeological and palaeontological Heritage Impact Assessments for the general area, as well as a good working knowledge of the site and surroundings. As there is a wealth of studies of both archaeology and palaeontology available (see the extensive bibliography), the identification of heritage indicators is well informed. Where relevant, specific reference to certain documents has been made in the text. The study is part of a broader integrated Heritage Impact Assessment that is to be undertaken by Ms Katie Smuts.

### **3.2 Field study**

A site inspection was carried out for the purposes of a previous wind energy initiative in the project area and while the wind farm process lapsed, the findings remain generally useful and relevant. The landscape has been subject to agriculture and has been disturbed throughout. The field study involved walking forays into the landscape (where possible) to check for archaeological material and covering the site as widely as possible to verify the condition of known sites. The area has been subject to previous research surveys and as a result a number of observations have been made. Anything found was recorded, photographed and mapped using a hand-held GPS.

No archaeological material was removed from the project site, but was rather recorded and photographed *in situ*. Affected landowners were also consulted with regard to knowledge of heritage resources on their properties.

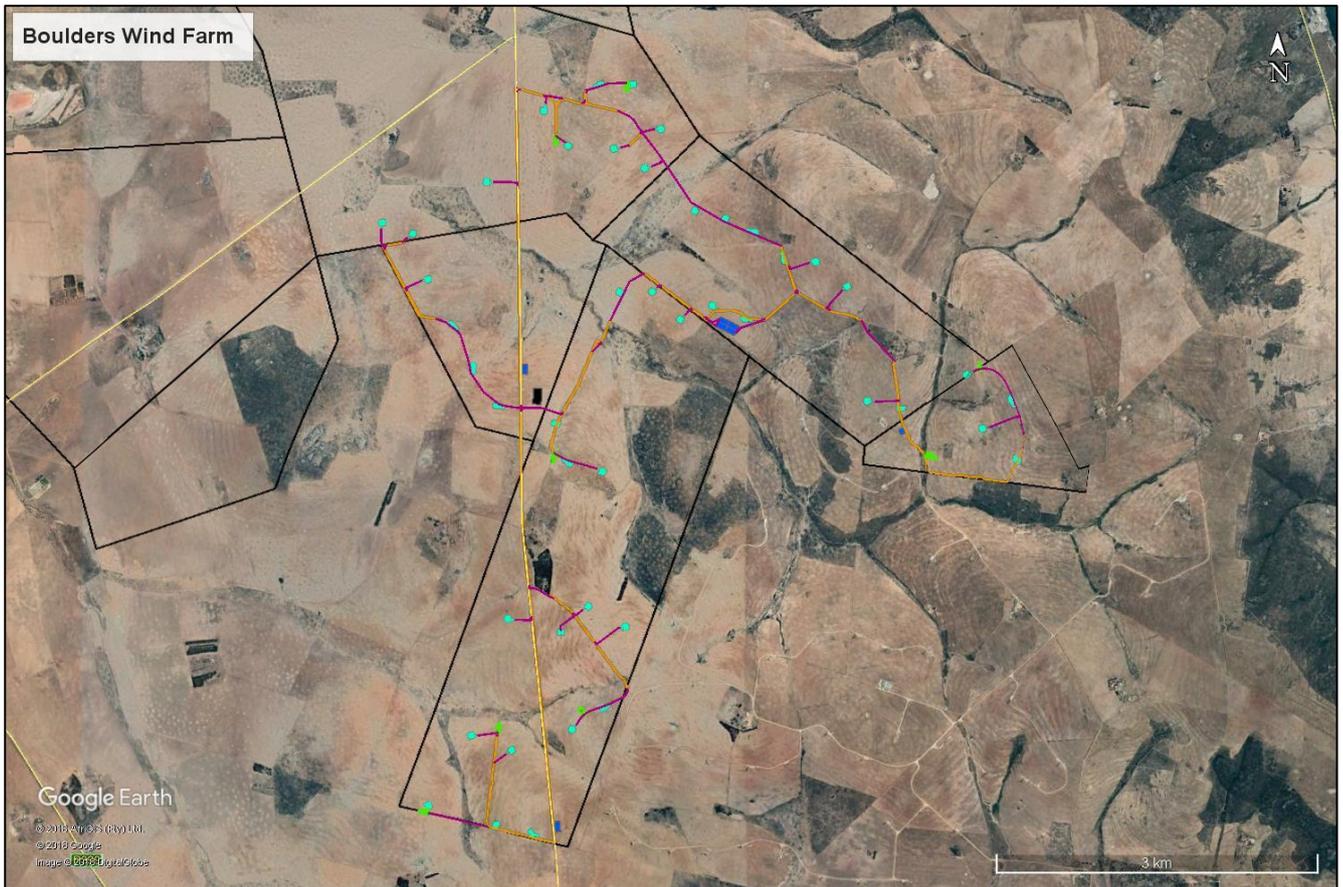


Figure 3: The proposed layout with crane pads and turbine sites (turquoise) and access roads, orange – existing road to be upgraded, purple – new road, bright green – temporary road, Laydown areas – blue polygon, sub-station – black polygon.

#### 4. HERITAGE: POLICY AND LEGISLATIVE FRAMEWORK

This AIA report is conducted in terms of Section 38 (8) of the National Heritage Resources Act, No 25 of 1999.

While the National Department of Environmental Affairs is the decision making authority acting in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) and Regulations (2014, as amended), they must ensure that the evaluation of the statutorily defined broad range of heritage resources fulfils the requirements of the relevant heritage resources authority in terms of Section 38 (3) of the National Heritage Resources Act (Act 25 of 1999) (NHRA) and that any comments and recommendations of the relevant heritage resources authority with regard to proposed development have been taken into account prior to the granting of the consent. The Provincial Heritage Resources Authority (PHRA) is a commenting body in the process.

In this case, the responsible Provincial Heritage Resources Authority for the Western Cape<sup>1</sup> is Heritage Western Cape (HWC). They have a defined process in order to achieve a final comment with respect to heritage resources.

In terms of Section 38 (1) (e) of the NHRA, the appointed Heritage Practitioner must submit a "Notice of Intent to Develop" (NID) form to the PHRA for initial adjudication of the project and to determine the need for, and scope of further specialist heritage studies. If it is clear from the NID that no significant heritage resources will be impacted, no further action in terms of heritage will be requested. The comment is submitted to the EAP for inclusion in the Environmental

<sup>1</sup> The National Department for Heritage management is the South African Heritage Resources Agency (SAHRA). They are responsible for management of Heritage resources in all provinces except the Western Cape and KwaZulu-Natal. The submission process to SAHRA differs from that of HWC.

Impact Assessment process. If the decision is that further studies are required, the PHRA will request that the additional specialist studies are done as part of an Integrated Heritage Impact Assessment (HIA). The integration is to ensure that there is a recommendation that takes into account the findings of the various requested specialist Heritage studies. The specialist studies may include studies undertaken routinely as part of the EIA process e.g. a Visual Impact Assessment (VIA), but often include Archaeological and/or Palaeontological Impact Assessments. If there is significant Built Environment heritage at the affected site, a study of the buildings and their significance could be requested.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

General protections applying to heritage resources are as follows:

#### **4.1 Structures (Section 34(1))**

No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by Heritage Western Cape (HWC), the responsible provincial heritage resources authority.

#### **4.2 Archaeology and Palaeontology (Section 35(4))**

No person may, without a permit issued by HWC, destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite.

Archaeological is defined as: "material remains resulting from human activity which is in a state of disuse and is in or on land and which is older than 100 years, including artefacts, human and hominid remains and artificial features and structures".

Palaeontological is defined as: "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".

#### **4.3 Burial grounds and graves (Section 36(3))**

No person may, without a permit issued by the South African Heritage Resources Authority (SAHRA)<sup>2</sup>, destroy, damage, alter, exhume or remove from its original position or otherwise disturb any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority.

### **5. NEED AND DESIRABILITY OF THE PROJECT IN TERMS OF ARCHAEOLOGY**

In archaeological terms the consideration of the WEF project development need or desirability is outside the realms of the archaeological discipline and that will be dealt with in the overall EIA study.

### **6. DESCRIPTION OF THE SITE**

#### **6.1 Environmental attributes**

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<sup>2</sup> In terms of an inter-agency agreement, HWC may issue permits for the Western Cape

The area consists mainly of an undulating agricultural landscape (primarily wheat) interspersed with patches of indigenous vegetation (Strandveld, or West Coast Renosterveld) growing on successions of older and recent sands ("heuweltjiesveld") that mantle the granites of the underlying Vredenburg pluton and the numerous extrusions that form the distinctive rocky hills and outcrops of the area. The largest and most prominent landmark in the area is the Kasteelberg koppie, a granite batholith which stands some 187 m above sea level, surrounded by agricultural lands.

Major drainage features are absent but numerous small seasonal drainage features are evident. Natural basins that formed in the protruding granite sheets are filled by rainwater and were used as water sources in the past, both by pre-colonial and colonial inhabitants of the area. They are still used today largely for watering stock and in more recent times, the granite basins (waterbakke) were often modified with cement walls to increase storage capacity.

Farm dams are largely absent although reservoirs and wind pumps are found across the landscape in order to water livestock. Although the area is primarily used for cereal production, sheep and cattle farming is the other predominant farming activity of the area and animals are contained in camps defined by the ever-present wire fences. There are numerous existing tracks and roads associated with farming of the area.

In the past, fishing played a major role in the region and the small towns of St Helena Bay, Saldanha and Paternoster had thriving fishing communities, and fish processing facilities.

Vredenburg is a thriving town that along with Saldanha, form the centre of the local economy. The construction of industrial facilities such as the oil storage depot, iron ore smelter, heavy mineral separation plant and development of the iron ore export terminal has meant an influx of people and resultant increase in urbanisation and industrialisation of the area.

Between Vredenburg, St Helena Bay and Paternoster however, the landscape is still largely agricultural in nature with vistas over farmland dotted with granite koppies to the sea. This area still epitomises the traditional farming landscape, and in turn is superimposed on vestiges of the older pre-colonial landscape used by the San and later the Khoekhoen who favoured the area.



Plate 1: Typical undulating topography with extensive wheat fields which cover large areas of the Vredenburg Peninsula.



Plate 2: The landscape with the prominent Kasteelberg koppie on the skyline

Due to constraints identified in the scoping phase and in this subsequent assessment, only some farms will have turbines erected on them namely Ptns 2 and 5 of Boebezakskraal 40, Ptn 2 of Fransvlei 46, Ptn 1 of Het Schuytie 21, Ptn 3 Schuytiesklip 22.

## **6.2 Conservation significance in terms of heritage**

Surveys of the archaeology over the years have shown that the Vredenburg Peninsula was inhabited for at least a million years. Characteristic occasional Early Stone Age (ESA) and Middle Stone Age (MSA) tools attest to this time depth. The last few thousand years however saw people from the Later Stone Age existing on the landscape and leaving behind characteristic marine shell residues, both along the immediate coastline, and further inland at, and around the granite outcrops, which provided shelter from wind and rain. These sites pertain to the heritage of the San and Khoikhoi who are undergoing a cultural revival in South Africa today.

Many archaeological sites focus on the granite outcrops scattered across the peninsula. The most significant complex of sites occurs on the outcrop known today as Kasteelberg, and has been the subject of ongoing research programs for a number of years. Surveys of many of the granite outcrops have occurred as part of this research. Kasteelberg was nominated as a Provincial Heritage site but due to circumstances to do with landowner permissions, has not been formalised. It remains however the most significant archaeological site that we know of on the Peninsula and is the reason for identifying it in the report. A buffer of 2km was proposed by HWC during the EIA process for the construction of the adjacent existing West Coast 1 WEF. We have further identified the viewsheds from Kasteelberg towards the coast as sensitive and our recommendation for no turbines in that coastal zone has been respected in the layout of the Boulders Wind Farm.

While areas of granite outcrops are unsuitable for agriculture, for that reason they are places where archaeological sites tend to be preserved, while those out in the open on the mantling heuweltjiesveld, have been disturbed by ploughing over many years (although one can sometimes still see dispersed traces of them).

Kasteelberg and the other scattered archaeological sites on the Vredenburg Peninsula contribute to the understanding of the pre-colonial use of the area. Significance often goes hand in hand with degree of intactness so it follows that some sites have higher significance, and others, such as those in ploughed land, are of lower significance.

Although farming was already happening on the peninsula from the 18<sup>th</sup> century, boundaries were mostly only formalised from the mid-19<sup>th</sup> century. No significant built environment has been identified on the site and buffers have in any event been established around all existing buildings and farm werfs.

In terms of graves, a single small farm cemetery with formal graves (2011/329: S32.80442800 E18.00421500) was found under a stand of bluegum trees on Ptn. 1 of Farm Het Schuytje 21, while a number of informal calcrete "arrangements" representing possible historical graves (2011/309 S32.78387800 E17.97445200) was observed on Ptn. 3 of Farm Schuitjes Klip 22.

## **6.3 Assumptions, uncertainties and gaps in knowledge**

### **6.3.1 Assumptions & limitations**

- We have made assumptions about broader heritage resources on the site based on results from previous heritage studies from the area and by looking for "heritage indicators" on aerial photos;
- We expected that archaeological resources would be limited and overall probably of low significance;
- We believe that we have identified the most relevant unpublished heritage reports from the area;
- Previous heritage surveys of the study area (excluding those undertaken by ACO) have not always provided track paths and it is not always clear how broadly and which areas were surveyed for heritage resources;
- Aerial photos give a broad sense of the heritage indicators and likely sensitivity, but due to angle, scale and resolution issues, they have limitations when trying to identify archaeological sites/features;
- We have not assessed the whole site in detail but rather have investigated areas identified as preferred turbine and associated infrastructure sites;
- There has been no detailed study of the histories of the farms comprising, and adjacent to the WEF site. We have looked at some of the Surveyor General's records in order to establish a baseline for colonial settlement and resources within the area;
- The presence of graves and/or graveyards has been informed by local knowledge of current residents of the affected farms who were consulted during our site visits. We cannot exclude the possibility of other isolated unidentified graves being present although the likelihood is considered to be very low;
- We have located a number of graves and/or graveyards where our assessment took us close to farm werfs (both modern and old). We assume colonial burials will be directly associated with farm werfs, or settlements while we presume that pre-colonial burials will be associated with clusters of pre-colonial sites, particularly on and around granite outcrops or areas where soft silty sands are available;
- There are no known "Red Flag" issues from an archaeological perspective on the site and we note that previously the West Coast 1 WEF was approved. We have taken note of the authorisations and appeals with regard to that WEF *vis a vis* with Kasteelberg, and applied them to this study;
- As far as we are aware, West Coast 1 is the only constructed WEF in the vicinity of the proposed project;

### **6.3.2 Information on heritage resources from previous heritage projects in the area**

The West Coast of South Africa has been "settled" for at least a million years. There are shell middens dating to the Middle Stone Age (MSA) both on, and to the north and south of the Vredenburg Peninsula (Halkett & Hart 1993, Halkett et al 2003, Klein et al. 2004, Berger and Parkington 2005a,b). Associated with these middens are MSA stone artefacts and occasionally, fragments of anatomically modern human remains e.g. a tooth from the Sea Harvest site (Grine & Klein 1993), and other anatomically modern post-cranial remains from Hoedjiespunt, are all clearly older than 50 000 years. The presence of the so-called Saldanha skull fragment, and the not infrequent regionally widespread finds of distinctive formal ESA artefacts such as handaxes, attests to a much more ancient use of the area, although, climate and coastline might have been very different at that time.

Although evidence of exploitation of marine resources by their ancestral MSA forebears is as yet scant and poorly understood, though appearing sporadic and expedient, Later Stone Age hunter-gatherers living on the west coast of South Africa during the latter part of the Holocene incontrovertibly made regular, and concerted (perhaps seasonal) use of the coastal resources. Archaeological excavations at sites such as Duyker Eiland on the coast near Britannia Bay (Robertshaw 1979) confirm the importance of shellfish such as mussels and limpets as dependable and easily accessible protein resources during these times. In addition, the excavations of other sites on the Vredenburg Peninsula (see Malan et al 2013) have confirmed the importance of coastal resources such as seals, marine birds, crayfish and beached whales in historical times. We know that the Vredenburg Peninsula was particularly attractive to hunter-gatherers, and later pastoralist groups because of the wealth of marine and terrestrial resources available there.

Archaeologists have postulated that the first pastoralist groups (at first with, sheep and pottery, and later cattle) entered southern Africa via the West Coast some 2000 years ago (Smith 2006). The most important pastoralist site on the Vredenburg Peninsula (and arguably in South Africa) found to date is that of Kasteelberg, located on the farm Rooiheuvel (ibid). The prominent hill is part of a granite batholith standing 187 m above sea level, today surrounded by agricultural lands. A site survey by Sadr et al. (1992) identified at least 36 discrete occupation areas around the hill ranging from Middle Stone Age scatters to Later Stone Age sites with pottery and domesticated stock remains. It would appear that Kasteelberg was particularly the focus of settlement for over the last 2000 years. At least 10 sites have been excavated around the hill and there are more than 100 grinding grooves on bedrock in the vicinity.

Kasteelberg was identified in the late 1990's as a site worthy of declaration as a National Monument under the old National Monuments Act (of 1969, as amended), but changes in legislation post-1994 interrupted the process. Heritage Western Cape has attempted to have the Kasteelberg Archaeological site complex declared as a Provincial Heritage Site (PHS), but resistance from the landowner has prevented finalisation of the process. It remains a highly significant site with *de facto* Grade II significance even though it has still not been formally declared in terms of any legal process.

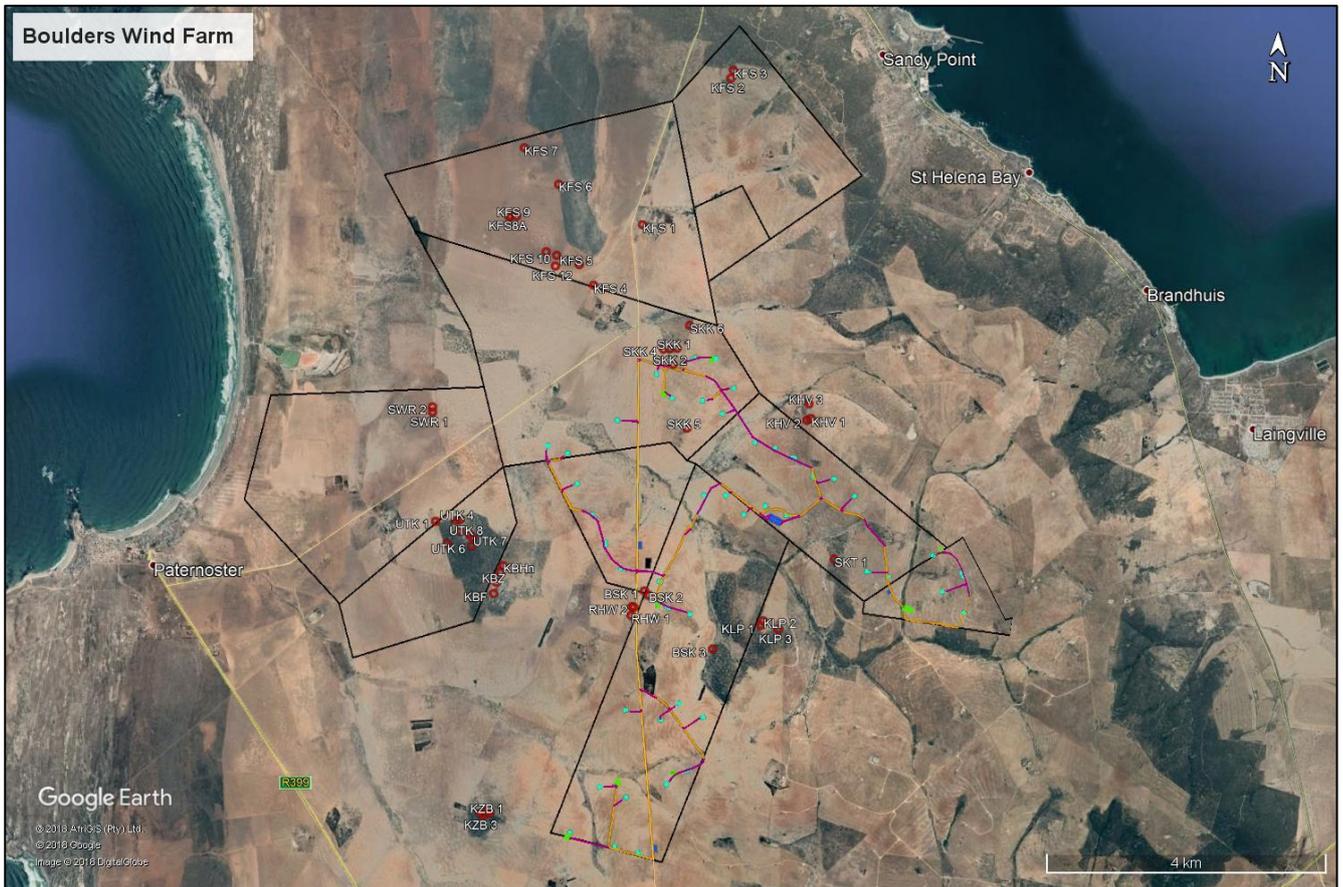


Figure 4: Known archaeological sites identified by Sadr (red circles) located within the project area with reference to the WEF layout (not all archaeological sites on the broader Peninsula are shown).

Other important archaeological sites in the vicinity of Kasteelberg include Witklip, a small shelter below a granite boulder situated on the western outskirts of Vredenburg. Excavations by Smith (2006) suggest that this was a hunter-gather settlement dating to between 3000 and 500 BP. The site of Heuningklip, an open shell midden site on a granite hill to the east of Vredenburg, also contains a number of bedrock grooves similar to Kasteelberg. The Paternoster Site A (shell midden), an archaeological site located in Paternoster is a declared PHS<sup>3</sup>.

The sites around Kasteelberg on the Vredenburg Peninsula predominantly date to the period of the Later Stone Age, although earlier material dating to the mid - late mid Holocene is found in the area and probably represent the debris of early San hunter gatherers. The survey of the Vredenburg Peninsula by Sadr (1992, 2009) has identified at least 99 archaeological sites concentrated predominantly around granite koppies, although in recent years, additional sites have been found in open wheat fields during archaeological impact assessment surveys (e.g. Webley & Orton 2010, Halkett 2012) (Figure 5).

### 6.3.2.1 Colonial Archaeology

Historical research shows that during the 18<sup>th</sup> century, the Vredenburg Peninsula formed part of the traditional grazing lands of the Cochoqua, a Khoekhoen pastoralist group. Smith (2006) has postulated a seasonal transhumant cycle between the coast and the interior which was disrupted by Dutch settlement. The Saldanha Bay area was the focus of intense competition between French and Dutch interests during the 17<sup>th</sup> and 18<sup>th</sup> centuries, with a number of military outposts established in the area to provide protection for fishing and sealing interests. One such post was established early on at St Helena Bay although its exact position is still unknown. A later military outpost was established on the hill overlooking the bay and became known as the Soldantenpost (Sleigh 1993).

<sup>3</sup> Provincial Gazette 6621 (April 2009) Notice 4620

No dedicated historical archaeological research has been conducted on the Vredenburg Peninsula, and unfortunately, due to circumstances, the information is not always accessible in Archaeological Impact Assessments as these did not necessarily discuss historical remains or the built environment. Recent research (Malan et al, 2013) shows that during colonial times there was in fact a thriving industry based on marine products centred on the Vredenburg Peninsula. Much of the product was returned to the settlement in Cape Town to feed its growing population.

The early 19th century quitrent grants include Zandfontein (1816) and Honingklip (1816) with a second wave of quitrent grants that included Dawidsfontein, Hollenvallei/Holvlei and Klipfontein. taking place in the 1830's.

## 7. OBSERVATIONS

### 7.1 Location and description of observations

Archaeological and built environment observations are listed on Table 3 and plotted on Figure 5. Selected photographs are presented later in this section of the report to document a selection of the heritage resources and landscape context of the WEF.

At scoping, and the subsequent EIA phase, sensitivity mapping of the heritage, resulted in the exclusion of places with strong heritage indicators (such as granite outcrops, streams, graveyards etc.). As a result of layout planning, the current layout will not impact on any identified occurrence, but amendment of one section of road next to a cemetery needs some adjustment (see section 8.1.1 Figure 7).

**Table 3:** Location, description and significance of archaeological and built environment resources relevant to the identified farms in the application

LABEL	LAT (s)	LON (e)	DESCRIPTION	SIGNIFICANCE
<b>2011 survey</b>				
2011/302	32.79672800	17.91634900	Ephemeral LSA shell and stone scatter on calcretised "heuweltjie" in a ploughed field. Qtz, sil, qzit and other flakes and chunks. 1 core and 1 broken and flaked lower grindstone fragment. Shells consist of very sparse black mussel fragments.	ungraded
2011/303	32.79015700	17.93798500	LSA Stone artefact scatter in a ploughed field. Qtz and sil predominant and likely to be an extension of Sadr's site SWR 2 where shell was not apparent. Another Sadr site, SWR 1, lies a little further to the south on the same granite koppie, and it has a denser stone artefact and shell scatter.	ungraded
2011/304	32.80294200	17.97176000	Very ephemeral LSA quartz artefact scatter in heavily ploughed land near a stream. Stone consists of a handful of qtz chips, chunks and flakes from a large area. 1 fragment of black mussel observed.	ungraded
2011/305	32.79240500	17.97638600	This is in fact Sadr's site SKK 5, but more precisely geo-positioned. LSA shell and stone artefact scatter on and amongst granite outcroppings in a ploughed field.	IIIC
2011/306	32.78332500	17.97361800	Foundation of a ruined structure on a granite outcrop. Approximately 15m long (3 rooms) with associated dump containing 19 <sup>th</sup> C ceramics, glass, bone. Marine shell also noted. Sites 307 and 308 are part of a complex. All are associated with natural water reservoirs in the granite outcrop ("waterbakke").	IIIC
2011/307	32.78436300	17.97396900	Foundation of a small ruin associated with site 306. 19 <sup>th</sup> c dump material scattered about.	IIIC
2011/308	32.78425500	17.97422600	Foundation of a small ruin associated with site 306. 19 <sup>th</sup> c dump material scattered about.	IIIC
2011/309	32.78387800	17.97445200	A number of informal calcrete "arrangements" representing possible historical graves on a soily mound area near to sites 306, 307, 308.	IIIA
2011/310	32.78391500	17.97454100	This is believed to be Sadr's site SKK 2, but more precisely geo-positioned. Extensive LSA shell and stone artefact scatter around granite outcroppings.	IIIA

			Associated with the "waterbakke".	
2011/311	32.78244400	17.97351900	This is believed to be Sadr's site SKK3, but more precisely geo-positioned. LSA Shell and stone scatter.	IIIC
2011/312	32.83637000	17.96376600	Very ephemeral LSA scatter in ploughed land near a stream. A few qtz and qzit flakes and a few black mussel shell fragments.	ungraded
2011/313	32.84228900	17.96084800	Ephemeral LSA shell and stone scatter in heavily ploughed field. Black mussel and limpet fragments with a few qtz pieces.	ungraded
2011/319	32.75784000	17.98999000	Ephemeral LSA shell scatter, black mussel/limpets in ploughed land. Some whole shells. Also some 19 <sup>th</sup> c glass and ceramics.	ungraded
2011/320	32.75540600	17.98764100	Ephemeral LSA Shell scatter (limpets) with a few qtz flakes near an old farmstead and low granite outcrop. Disturbed area at a gate in the corner of a ploughed field.	ungraded
2011/321	32.75458800	17.96263100	Ephemeral LSA scatter in ploughed land. No whole shell seen and no stone artefacts observed. Just off the edge of a limestone/calcrete ridge.	ungraded
2011/322	32.75683500	17.96207200	Extensive ephemeral shell with similar context as site 321. No stone seen but 1 pot fragment was noted.	ungraded
2011/323	32.76028300	17.96927800	Very ephemeral LSA shell (limpet and mussel) and stone (qtz and qzit) scatter. Very disturbed area near a gate and water trough in the corner of a ploughed field.	ungraded
2011/324	32.76084500	17.96494000	Fairly dense shell scatter in the middle of a ploughed field near the edge of a prominent limestone/calcrete ridge. Appears to be quite discrete (approx 25m diam). Limpet, mussel and whelk of which several whole specimens noted. Pottery fragments. Stone includes an upper grindstone, and a combination of upper grindstones/ hammerstones. This may be a series of small sites that have had their edges obscured by ploughing.	IIIC
2011/325	32.76257400	17.96123700	LSA shell and stone scatter in ploughed land. Limpet, mussel and whelk with whole shells seen. Stone includes a qtzite flake and an upper grindstone.	ungraded
KFS5	32.77156	17.95944	One of a series of sites previously identified by Sadr et al. It is an extensive shell and stone scatter in open ploughed land. Probably a series of smaller sites with edges obscured by ploughing. Stone includes qtz, qzit and sil. Pottery was noted.	IIIC
2011/326	32.76899100	17.94490900	Ruinous vernacular farm building	IIIC
2011/327	32.79076800	17.99379300	Stone scatter amongst granite boulders. Lots of sil and qtz. Much of the material might be of MSA origin (just outside the farm boundary of WEF).	IIIC
2011/328	32.80286200	17.99131900	Shell and stone scatter in ploughed field. Quite discrete, comprising mussel, limpet and stone artefacts including cobbles (manuports), cores, broken Upper Grindstone.	ungraded
2011/329	32.80442800	18.00421500	Family graveyard comprising two formal graves with marble headstones. Each grave contains two persons. One grave is that of Jacobus Lombaard (died Sept 1891)	IIIA

			and Jacomina Lombard (daughter 9yo, died May 1922). The other grave is that of Benjamina Lombard (wife of Jacobus - died 10 Aug 1910) and Jacomina Pienaar (died 29 Aug 1910). Jacobus' grave is walled. The area is within a fence.	
<b>2015 survey</b>				
D001	32.75562096	17.98855696	Scatter of marine shell, approximately 10m diameter with granatina/ granularis/ whelk with some silcrete, quartz, oes and pottery. There is a "klipbak" nearby.	ungraded
D002	32.75571903	17.98857599		
D003	32.75610100	17.98890003		
D004	32.76408702	17.99096399	Scatter of fragmented shellfish granatina/ granularis/ black mussel/ whelk close to calcrete outcrop. Qtz flakes and cores and flaked qzite manuports/ cobbles, ccs - see also L002-L008.	ungraded
D005	32.76412901	17.99107304		
D006	32.76416103	17.99118896		
D007	32.76416103	17.99126700		
D008	32.76414603	17.99134897		
D009	32.76414896	17.99148501		
D010	32.76399499	17.99126398		
D011	32.76394101	17.99123003		
D012	32.76402097	17.99109299		
D013	32.76407797	17.99106499		
D014	32.76411703	17.99103599		
D015	32.76423899	17.99094798		
D016	32.76427997	17.99090699		
D017	32.76430797	17.99096902		
D018	32.76423496	17.99106097		
D019	32.76424896	17.99084698	Very dispersed fragmented marine shell granatina/ granularis/ argenvillei/ black mussel - see also L009 to L016	ungraded
D020	32.76425097	17.99079199		
D021	32.76422197	17.99067901	isolated quartz scraper	ungraded
D023	32.76040996	17.95597902		
D024	32.76002700	17.95590702	Small ruined mud brick dwelling with scatter of marine shell in vicinity	ungraded
D025	32.76073996	17.95585798		
D026	32.76036303	17.95562496		
D028	32.79164303	17.97331698		
L001	32.75585499	17.98884404		
L002	32.76411803	17.99100900	Scatter of fragmented shellfish granatina/ granularis/ black mussel/ whelk close to calcrete outcrop. Qtz flakes and cores and flaked qzite manuports/cobbles, ccs	ungraded
L003	32.76416598	17.99095703		
L004	32.76425701	17.99098101		
L005	32.76426899	17.99101604		
L006	32.76422197	17.99104999		
L007	32.76421904	17.99103599		
L008	32.76407998	17.99085100		
L009	32.76057098	17.95575698		
L010	32.76065698	17.95588103		
L011	32.76074901	17.95596200		
L012	32.76073200	17.95606803		
L013	32.76061398	17.95624103		
L014	32.76081800	17.95603702		
L015	32.76068598	17.95577198		
L016	32.76060401	17.95570803		
L017	32.77053698	17.95453800	Disturbed area with ephemeral shellfish - Granularis/ argenvillei/ black mussel. Also 2 potsherds	ungraded
L018	32.77092800	17.95421203	Marine shell frag - granatina with large qzite manuport	ungraded
L019	32.79194302	17.97463001	Granite outcrop with "waterbakke"	ungraded

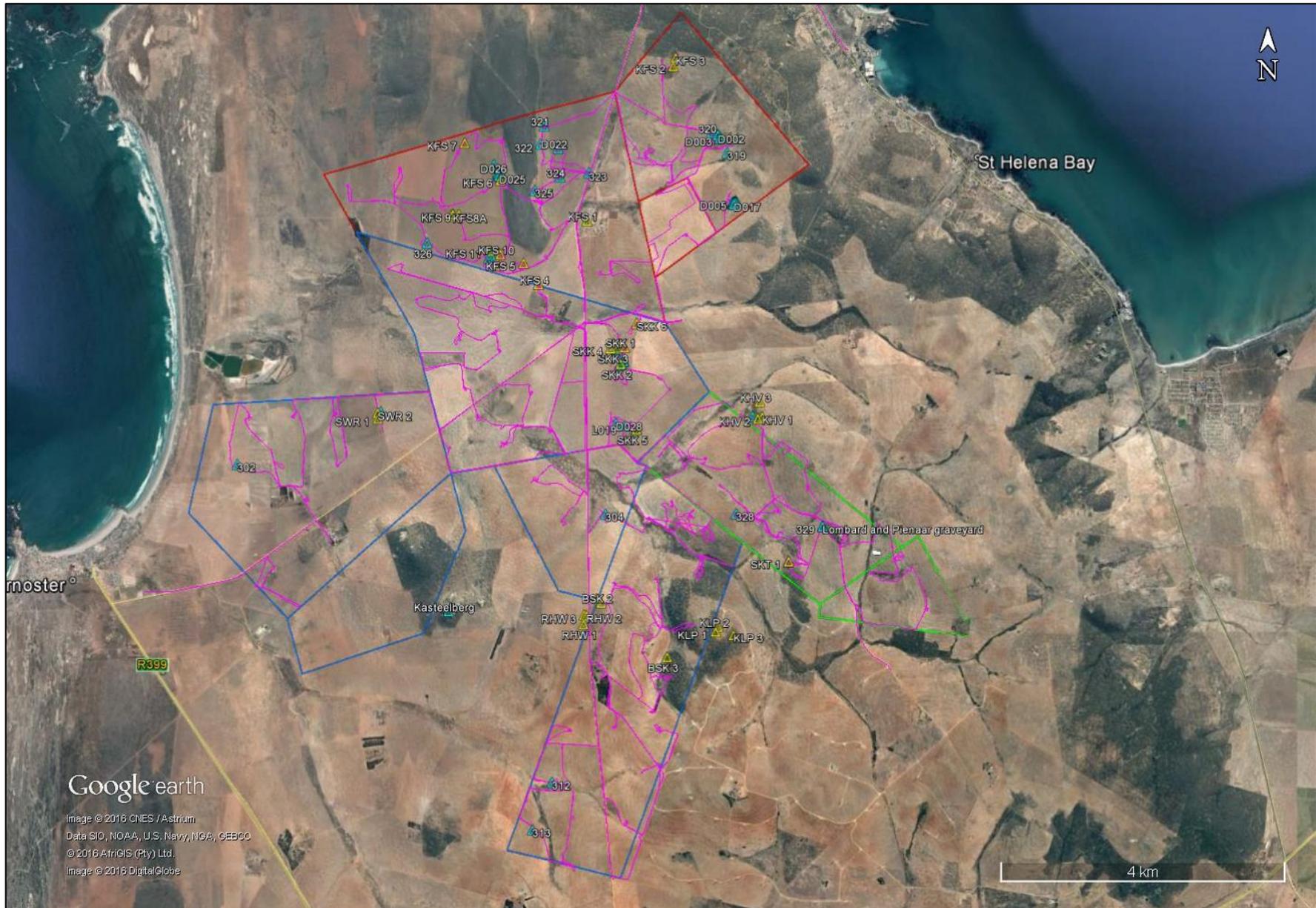


Figure 5: Archaeological sites located during 2011 and 2015 surveys (blue triangles), Sadr survey sites (yellow triangles) and tracks (purple).

## 7.2 Artefactual material – Stone age

The majority of the 33 identified archaeological occurrences are Late Stone age sites. These are usually identified by varying quantities of marine shell residues sometimes with associated stone artefacts and pottery. Stone artefacts are generally non-formal except for grindstones and hammerstones. Cores and occasional scrapers are noted but are not common. A single site (2011/327) appears to date to the Middle Stone Age. As with the Historical sites, LSA sites are sometimes associated with “waterbakke”.



Plate 3: Typical granite rock outcrop that is common on the Vredenburg Peninsula



Plates 4 - 6: Typical artefactual items found at Late Stone Age sites (l) potsherd (m) core, (r) selection of flakes on silcrete and quartz.



Plates 7 - 8: Typical broken lower grindstone made on quartzite and occasional remnants of archaeological sites are found in ploughed fields.

### 7.3 Built environment

Of the 33 identified archaeological occurrences in the WEF area, 4 contain built environment remains.

2011/306 is the foundation of a ruined structure on a granite outcrop, approximately 15m long (3 rooms) with an associated dump containing 19<sup>th</sup> C ceramics, glass and bone. Marine shells were also noted. Sites 2011/307 and 2011/308 are associated ruinous foundations of small structures where 19<sup>th</sup> c artefacts were also scattered about. All are associated with natural water reservoirs in the granite outcrop ("waterbakke"). 2011/326 is a ruined vernacular farm building.



Plate 8: Typical "waterbak" depression formed in the granite bedrock are natural storage dams and used by people and animals alike. They were often modified in historical times to increase storage capacity. Plate 9: Typical 19<sup>th</sup> century material associated with ruined structures, glass and transfer printed refined earthenware.

### 7.4 Cemeteries

A single small farm cemetery with formal graves (2011/329) was found under a stand of bluegum trees on Ptn. 1 of Farm Het Schuytje 21, while a number of informal calcrete "arrangements" representing possible historical graves (2011/309) was observed on Ptn. 3 of Farm Schuytjes Klip 22.

The family graveyard contains two formal graves with marble headstones. Both graves contain 2 persons. According to the inscriptions, one grave is that of Jacobus Lombaard (died Sept 1891) and Jacomina Lombard (daughter, aged 9, died May 1922). The other grave is that of Benjamina Lombard (wife of Jacobus - died 10 Aug 1910) and Jacomina Pienaar (died 29 Aug 1910). Only Jacobus Lombaard's grave is walled, while the cemetery is fenced though rather neglected.



Plates 10 - 12: The small farm cemetery 2011/329. (l and m) the walled grave of Jacobus and Jacomina Lombard, (r) The grave of Benjamina Lombard and Jacomina Pienaar. The proximity of the existing farm road can be deduced in the background and is relevant to its upgrade as part of the WEF infrastructure.

## 8. SPECIFIC IDENTIFIED HERITAGE SENSITIVITY OF THE SITE

### 8.1 Identification of areas to be avoided/buffers

A final “constraints and sensitivity” map, is provided below (Figure 6). Sensitivity polygons identify areas where heritage resources may be present, based on the identified heritage indicators. We have considered existing buffers set by DEA and HWC for the West Coast 1 WEF project as these may apply to the Boulders Wind Farm site as well. We have also identified no-go areas where there is known archaeological heritage located around granite koppies (indicated as red zones), within which no infrastructure may be located. This information has been considered by the proponent for the design of the facility layout and turbine and infrastructure layout has taken cognisance of all buffers and no-go areas in order to ensure that no wind farm infrastructure infringes on any sites/features of high sensitivity. Nevertheless, the small farm cemetery (2011/309) is located close to a farm road that will be upgraded as part of the WEF. Although not impacted by the road, the cemetery must be identified during the construction phase to prevent any incursion into the area (see section 8.1.1 and Figure 7 for detailed discussion of the measures to protect the cemetery).

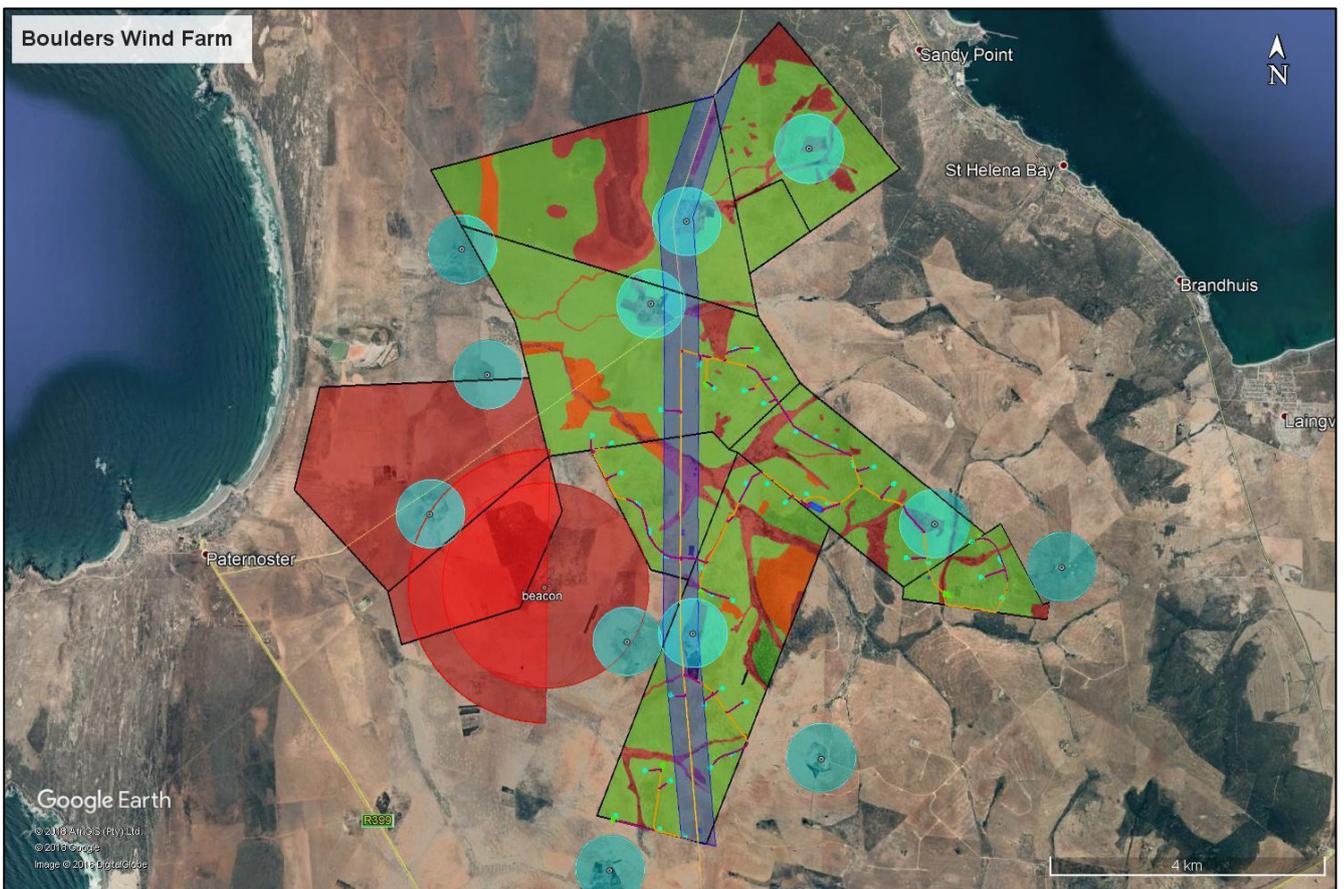


Figure 6: Sensitivity map with superimposed turbine and infrastructure layout. Sensitivity areas: Green – acceptable, Orange – acceptable, not preferred, Red – no go. Buffers identified after a review of existing environmental and heritage authorisations for wind energy on the Vredenburg Peninsula (blue range rings: 500 meters from identified houses and farm complexes, red range ring: larger 2km smaller 1.5km around Kasteelberg, Purple buffer: 250 meters on either side of the Vredenburg – Stompneus Bay road). Layout: purple lines – new roads, orange – existing roads to be upgraded, bright green – temporary roads, turquoise – crane pad with turbine, blue rectangle – laydown area, black rectangle – on site sub-station.

Buffers need to be avoided by the wind farm infrastructure due to potential high heritage sensitivity and visual considerations, but in some instances are dictated by safety when turbines are in proximity of occupied farms or roads, in the event a turbine should fail. Not all farms have high heritage value. The Stompneus road buffer was in terms of the previous West Coast 1 WEF environmental authorisation. After considering changes to the landscape with construction of

West Coast 1 WEF when the buffers were recommended, we have suggested that some relaxation can be accommodated. The Stompneus Road buffer has been reduced to 250m on either side from an archaeological perspective and can be further reduced on the advice of the Visual Specialist. From an archaeological perspective a reduced 1.5 km buffer to the east of Kasteelberg is recommended.

Light green (preferred) areas consist largely of previously or currently ploughed land. While some archaeology may be present in these areas, disturbance diminishes the scientific value somewhat. Nevertheless, some information can still be derived from such material. Turbines and infrastructure are most favoured in the light green areas. Red demarcated areas are not favoured for development due to the presence of known heritage resources (no-go areas), or where heritage resources are very likely to be located based on heritage indicators. Streams and water bodies (orange) are identified as heritage indicators and will probably not be used due to the ecological sensitivity associated with them (these areas are of a medium sensitivity and considered to be acceptable from an archaeological perspective, but not preferred for development).

Buffer areas indicated by blue range rings (500 meters) are placed around houses and farms (centrepnts) (to be avoided by infrastructure). A 2 km buffer around Kasteelberg was negotiated with HWC during the West Coast 1 EIA. Similarly, the buffer along the Stompneusbaai road (500 m) and the R45/R399 (2 km) was set by DEA, after the Environmental authorisation for West Coast 1 WEF was granted. The recommended buffer zones have been considered in the design, and it is noted that the Grade II heritage site of Kasteelberg will not be directly affected, by the Boulders Wind Farm as it is located outside of the project site.

### 8.1.1 Sensitive areas – new/upgraded roads

The proposed upgrade to the existing farm road to the west of the Farm Skuitjie is shown in purple on Figure 7. The road as shown brings it close to the small cemetery (2011\_329 at s32.80442800 e18.00421500) and we suggest that it should be shifted moderately to the west (as indicated by the white alignment) to avoid any possible impact.



Figure 7: A small farm cemetery is located at the point 329. The existing farm roads are visible and relevant parts of the camp fence in the area shown in yellow. The proposed upgrade alignment (purple). Proposed moderate re-alignment suggested by the archaeologist (white). We have assessed the other road infrastructure at a desktop level and are satisfied that the heritage sensitivities are respected.

## **8.2 Restrictions**

There were no limitations on conducting the survey and ground visibility was generally very good. Several surveys have been done on this and adjoining farms which results in a high confidence in terms of the findings of this study.

### **8.2.1 Information on heritage resources from previous heritage projects in the area**

In terms of the archaeology, there are some particularly relevant research and Impact Assessment reports available and relevant that can be considered as part of this study. Of particular relevance is the West Coast 1 EIA report (Webley et al 2010), which assesses a WEF on an adjacent site in very similar context to the one under assessment here. The Sadr et al. (1992) research survey has also been useful for identifying a number of archaeological sites in the WEF site. Smiths' research on excavations at Kasteelberg (2006) identified the significance of the site as a whole.

## **9. CUMULATIVE IMPACTS ON ARCHAEOLOGICAL RESOURCES**

As far as we are aware, West Coast 1 is the only and constructed and currently operational WEF in the immediate vicinity of the proposed Boulders Wind Farm (See Figure 8). The archaeological resources on the proposed Boulders Wind Farm site are however limited and of medium to low scientific value and significance, though some are certainly part of the broader complex of sites that arose during the period when Kasteelberg was in use. Significant cumulative physical impacts on the archaeology have already occurred due to agriculture, but fortuitously, many sites tend to cluster on and around granite outcrops which are avoided during ploughing. Optimally, sites considered to be of significance should be excluded from development, but due to the nature of archaeological resources, it is not always possible to identify every occurrence and so some attrition does occur when buried resources are disturbed. By limiting WEF development to ploughed land or away from identified sites or indicators, the cumulative impact is lessened.

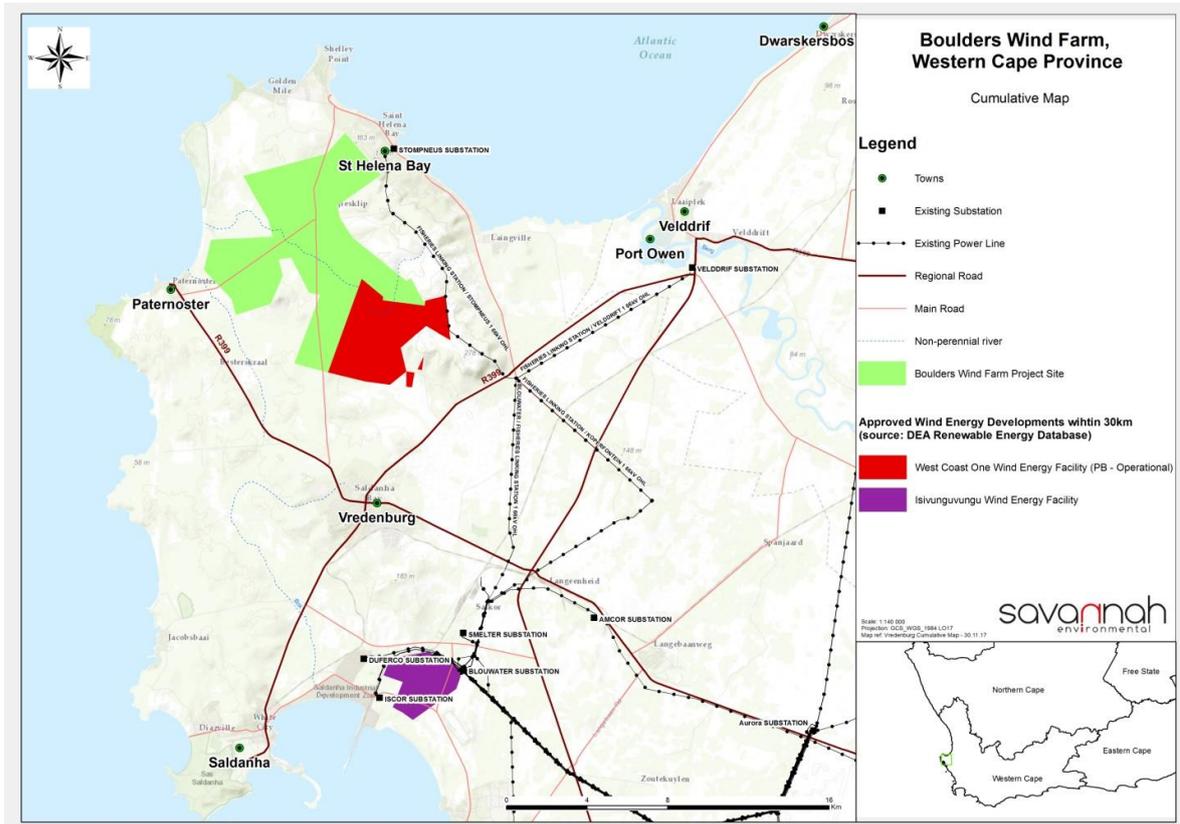


Figure 8: Wind farms in the vicinity of the Boulders project

The archaeological cumulative impact is difficult to measure accurately apart from to state that destruction of archaeological material was largely avoided during the construction of the West Coast 1 WEF (Webley et al 2010). Indications are that this will be the case with respect to the Boulders Wind Farm. Cumulative assessment is indicated in Table 4. Refer to Appendix 1 for the Impact Assessment methodology.

Table 4: Cumulative impacts of the Boulders Wind Farm

<b>Nature:</b> Cumulative impact on physical Archaeological sites during the construction of the Boulders WEF and other similar facilities in the area. Impacts on archaeology are not expected as the proposed layout has been designed to avoid sensitive areas.		
	<b>Overall impact of the proposed project considered in isolation</b>	<b>Cumulative impact of the project and other projects in the area</b>
<b>Extent</b>	Low (1)	Low (1)
<b>Duration</b>	Medium-term (3)	Medium-term (3)
<b>Magnitude</b>	Low (4)	Low (4)
<b>Probability</b>	Improbable (2)	Probable (3)
<b>Significance</b>	<b>Low (16)</b>	<b>Low (24)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Unlikely	Unlikely
<b>Can impacts be mitigated?</b>	Yes	Yes
<b>Confidence in findings:</b> High.		
<b>Mitigation:</b>		
<ul style="list-style-type: none"> <li>Archaeological resources have been identified where surface indications are visible and they are excluded from development;</li> <li>Amendments to infrastructure has been suggested where it is felt impacts to archaeological resources may occur;</li> <li>Development is generally located within ploughed land where impacts on archaeological</li> </ul>		

resources are already likely to have occurred;
• Any unanticipated archaeological resources or burials uncovered during earthmoving are cordoned off and must be reported to the archaeologist and HWC for assessment and action;
<b>Residual Risks:</b> Finding buried archaeological resources or burials during earth moving

In our opinion, the cumulative impact of the Boulders Wind Farm project with the indicated layout in this location in relation to the operational and approved WEF facilities within the area will be low. This sensitivity rating is based on the assumption that each WEF developed will be required to avoid and/or mitigate the impacts on archaeological resources. Therefore, each facility will ensure the conservation or mitigation of the significant archaeological features present within the project site being developed for a WEF. The construction of the Boulders Wind Farm will not give rise to an unacceptable increase in impact or loss of archaeological resources when taken in conjunction with other similar projects in the area.

### 9.1 Methodology for assessing impact

Impact assessment was undertaken according to the instructions supplied by Savannah Environmental (Pty) Ltd that can be found in Appendix 1.

No impacts are expected for either the operation phase or the closure phase. If impacts were to occur to archaeological resources, they are most likely to occur in the construction phase during earth moving activities as indicated below.

### 9.2 Impact tables

Most impacts will occur during the construction phase of the project and have been assessed below. Operation and decommissioning is not expected to result in any impacts and was therefore not considered as part of this assessment.

#### 9.2.1 Impact on archaeological resources (excluding visual impact)

Table 4: Impact on physical Archaeological sites during the construction of the WEF and the associated infrastructure.

Nature: Impact on physical Archaeological sites during the construction of the Boulders WEF and associated infrastructure. Impacts on archaeology are not expected as the proposed layout has been designed to avoid sensitive areas.		
	<b>Without mitigation</b>	<b>With mitigation</b>
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Low (24)	Low (16)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Yes, should the sensitive archaeological sites not be avoided.	Yes, should the sensitive archaeological sites not be avoided.
Can impacts be mitigated?	Yes	Yes
Mitigation	Every effort has been made to design the layout to avoid sensitive areas, however accidental impacts and finds during construction are possible, in which case the find must be reported to an archaeologist and/or Heritage Western Cape for assessment and action.	

The complex of archaeological sites on Kasteelberg has been indicated as a no go area and therefore no direct physical impacts on archaeological resources can occur from construction

activities on those parts of the koppie in the Boulders Wind Farm project site. The Visual impacts, particularly the views from the Koppie to the coast have been considered and turbine placement was excluded from areas around the koppie in line with earlier decisions by Heritage Western Cape with respect to West Coast 1 WEF. Most public comments with respect to heritage resources received by the EAP during the Scoping Phase (other than visual issues) related to Kasteelberg. Visual issues with respect to Kasteelburg are discussed in the VIA.

### 9.2.2 Impacts on the built environment (excluding visual impact)

Table 5: Impact on the physical built environment heritage resources during the construction of the WEF and associated infrastructure.

Nature: Impact on the physical built environment heritage resources during the construction of the WEF and associated infrastructure. Impacts to the built environment are not expected as the proposed layout has been designed to avoid these sensitive areas.		
	<b>Without mitigation</b>	<b>With mitigation</b>
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Improbable (2)	Improbable (1)
Significance	Low (24)	Low (8)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Yes, should the sensitive built heritage resources be damaged or destroyed	No, sensitive built heritage resources have been identified and no infrastructure will impact due to careful layout.
Can impacts be mitigated?	Yes	Yes
Mitigation	Every effort has been made to design the layout to avoid sensitive built environment , however accidental impacts during construction are possible, in which case the issue must be reported to the archaeologist and Heritage Western Cape.	

Farm werfs and buildings have largely been excluded from any development activities associated with the Boulders Wind Farm. A few small ruins were identified and are in areas to be excluded from development (i.e. no-go areas).

### 9.2.3 Impacts on cemeteries and graves

Table 6: Impacts on known cemeteries and graves during the construction of the WEF and associated infrastructure

Nature: Impacts on known cemeteries and graves during the construction of the WEF and associated infrastructure. Impacts to graves and cemeteries are not expected as the proposed layout has been designed to avoid these sensitive areas.		
	<b>Without mitigation</b>	<b>With mitigation</b>
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (6)
Probability	Improbable (2)	Improbable (2)
Significance	Low (28)	Low (24)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Yes, should the cemeteries and graves not be avoided.	Yes, should the cemeteries and graves not be avoided. The loss will be mitigated by careful

		recovery and possibly relocation though a change in context would occur.
Can impacts be mitigated?	Yes	Yes
Mitigation	Every effort has been made to design the layout to avoid known graves. There is a low likelihood of uncovering human remains/graves that were not marked on the surface and accidental impacts on such finds during construction are possible. If found, the area must be cordoned and carefully covered with a plastic sheet. The find must be reported to an archaeologist and Heritage Western Cape for assessment and action.	

Unmarked graves are not easily identified in surveys and as a result, if found, they must be dealt with on a case by case basis. If found, human remains must be carefully covered and cordoned off but otherwise be left further undisturbed. The find must be reported to an archaeologist who will inspect the remains and assess what action needs to be taken in consultation with HWC. Some involvement of the relevant Heritage Authority will be required in terms of the legal process to be followed in the case of exhumation. Permits will be required in such cases.

Table 7: Summary of the impacts on physical heritage resources

<b>IMPACT</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>Construction Phase</b>		
Impact on physical Archaeological sites during the construction of the WEF and the associated infrastructure.	Low	Low
Impact on the physical built environment heritage resources during the construction of the WEF and the associated infrastructure.	Low	Low
Impact on known cemeteries and graves during the construction of the WEF and the associated infrastructure.	Low	Low

### 9.3 Positive and negative heritage impacts

The proposed activity has a low chance of impacting heritage resources negatively through physical destruction/damage during the clearing of the ground and installation of infrastructure in the construction phase. No impacts are expected to occur during the operation phase.

The important clusters of sites at granite outcrops are avoided for the installation of turbines and infrastructure. Although some occurrences of marine shell and artefacts are found in ploughed land, they tend to be disturbed surface occurrences usually with low significance. No mitigation has been proposed, but any accidental finds of such material should be assessed to determine significance and need for mitigation.

We have identified the need to moderately amend the alignment of one section of access road which otherwise may impact a small farm cemetery as discussed in section 8.1.1. The amended alignment would achieve a positive result.

### 9.4 Key issues

At this time we cannot identify any significant constraints on the site with respect to physical archaeological material other than those discussed above and no "red flag" issues are identified with respect to archaeological material. The layout assessed as part of this report is considered

to be acceptable from an archaeological perspective and will not create unacceptable loss in terms of the archaeological resources located within the site.

## **10. CONCLUSIONS**

Although one Middle Stone Age artefact scatter was found, the archaeological material in the WEF site consists predominantly of Late Stone Age archaeological marine shell and artefact scatters found on, or close to granite outcrops or high points on the landscape. Some material is found in ploughed land where it is usually disturbed by years of agriculture. The LSA sites are assessed to be of generally medium to low sensitivity.

A few ruinous structures were identified during the surveys and are also excluded from development by extensive sensitivity mapping that informed the preferred WEF layout. There is no other significant built environment within the WEF site and all farm werfs have been provided with 500 meter buffers.

A single small farm cemetery was identified and considered to be a "no go" area which will ensure its protection during the construction phase. We have suggested that the alignment of a section of a new access road close to the cemetery is modified to avoid impacts of the cemetery.

The current site layout has been designed in consideration with the sensitive archaeological sites and areas in the planning process in the early stages of the project. The result is that impacts to archaeological heritage and historic sites are not expected and can be rated as being of a low significance. The project is therefore considered acceptable and can be authorised from an archaeological perspective, subject to the implementation of the recommended mitigation measures.

Some monitoring of earthmoving during the construction phase should take place to ensure compliance and effectiveness of the mitigation.

## **11. SUGGESTED MITIGATION**

- Extensive sensitivity mapping by all the specialists including heritage has gone a long way towards mitigating impacts on the site, and no major mitigation of physical heritage archaeological resources is anticipated. No stratified contexts were recognised;
- The Lombard and Pienaar cemetery (2011\_329 at s32.80442800 e18.00421500) has been identified as a "no-go" area. As the existing farm road that passes the cemetery site will be upgraded as an access road during turbine construction we have suggested that the alignment is modified and that the road should be shifted moderately to the west (as indicated by the white alignment on Figure 7) to avoid any possible impact on the cemetery. During the construction phase, the cemetery must be identified by hazard tape and avoided;
- Avoidance and conservation of significant heritage resources is through buffers, no-go areas around farm buildings and graveyards, archaeological sites or complexes and has largely already been achieved in the proposed layout assessed in the archaeological impact assessment;
- Accidentally discovered archaeological material must be reported to the Provincial Heritage Authority in terms of section 35 of the National Heritage Resources Act. The finds should also be reported to the appointed archaeologist for assessment and possible action;
- Accidentally discovered human remains must immediately be reported to the Provincial Heritage Authority in terms of section 36 of the National Heritage Resources Act. The finds should also be reported to the appointed archaeologist for assessment and possible action;
- The ECO should be informed of any accidental finds;

- Some monitoring of the construction activities by the archaeologist is required to determine the effectiveness of the mitigation. This will be at earthmoving stage to ensure that there are not significant buried archaeological resources being exposed.

As we cannot exclude the presence of unmarked graves on the site, any human remains that are accidentally uncovered must be dealt with on a case by case basis. When found, the remains should be covered and cordoned off and further left undisturbed. The find must immediately be reported to an archaeologist and HWC. The archaeologist must assess the remains and suggest a way forward.

Table 8: Measures for inclusion in the Environmental management Program

OBJECTIVE: To ensure that archaeological and built environment resources and graves are not impacted during construction of the Boulders WEF.		
Project Component/s	List of project components affecting the objective	
Potential	Archaeological and built environment resources and graves are impacted by construction or related activities resulting in loss of information, and/or impacts to the Cultural Landscape.	
Activity/risk source	<ul style="list-style-type: none"> <li>• Any earthmoving;</li> <li>• Movement and use of construction equipment on the site;</li> <li>• Unauthorised collecting of heritage resources by construction staff;</li> <li>• Non-reporting and loss of accidental finds of archaeological material or human remains.</li> </ul>	
Mitigation: Target/Objective	<ul style="list-style-type: none"> <li>• Respect all general heritage buffers/ no go areas on the site;</li> <li>• The Lombard/Pienaar cemetery must be identified by hazard tape during the construction phase;</li> <li>• The construction road running past the cemetery must be amended to avoid damage to the cemetery through heavy/wide loads;</li> <li>• Any accidental finds of archaeological material or human remains must be reported to the ECO, Provincial Heritage Authority and the Archaeologist so that the material can be evaluated and mitigation can take place as required.</li> </ul>	
Mitigation: Action/Control	Responsibility	Timeframe
Monitoring earthmoving for archaeological resources	ECO, Archaeologist	Monitoring earthmoving on ad hoc basis until completion of that component
Performance	Archaeological and built environment resources and graves are not impacted by construction or related activities.	
Monitoring	<ul style="list-style-type: none"> <li>• Earthmoving for new roads should be inspected by the archaeologist on an ad hoc basis until it is established that no impacts are occurring;</li> <li>• Earthmoving at selected turbine sites should be inspected by the archaeologist on an ad hoc basis until it is established that no impacts are occurring;</li> </ul>	

- |  |   |
|--|---|
|  | <ul style="list-style-type: none"><li>• The alignment of the construction road in the vicinity of the Lombard/Pienaar cemetery must be approved by the archaeologist prior to its construction.</li></ul> |
|--|---|

## 12. REFERENCES

The bibliography includes:

- Unpublished Archaeological/Palaeontological/Heritage Assessments
- Theses
- Published materials

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## Appendix 1

### Assessment methodology for scoping reports - Provided by Savannah Environmental (Pty) Ltd.

#### VREDENBURG WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE, WESTERN CAPE PROVINCE

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##### TERMS OF REFERENCE FOR UPDATE OF SPECIALIST REPORTS

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Dear Specialist,

As per our discussion, Savannah Environmental is taking over the Vredenburg Wind Energy Facility project from Terramanzi and is now the new environmental consultant on the project. This new EIA process will include both Scoping and EIA phases and therefore updates to the existing specialist reports will be needed to ensure that all current requirements are complied with in the studies.

The main updates to the reports required will include:

- » Updates to ensure reports comply with the 2014 EIA Regulations, as amended in April 2017 and the inclusion of a checklist of where in the report the requirements were met.
- » Updates to the project description and project details (to be finalised in due course by the developer).
- » Updates to the Scoping Report impact assessment to make use of the Savannah Environmental Impact Tables
- » Updates to the EIA Report assessment methodology to reflect the Savannah Environmental methodology.
- » Inclusion of a separate cumulative impact assessment in the EIA Report as per the Savannah Environmental cumulative impact tables.
- » Update of EMP recommendations to reflect the Savannah Environmental EMP tables.
- » Updates to the sensitivity mapping in both the Scoping and EIA Reports. Sensitivity mapping should illustrate what the feature is and then indicate the sensitivity of the feature.
- » A new layout for the project will need to be considered in the EIA Report (to be provided).

The following sections provide the requirements as per the EIA Regulations that need to be complied with, the Scoping Report impact tables to be used, the assessment methodology to be applied, the impact tables to be used in the EIA Report including for the cumulative assessment and EMP and an example of a sensitivity map illustrating the sensitive features.

Requirements for Specialist Studies as per Appendix 6 of the EIA Regulations, as amended April 2017<sup>1</sup>

A specialist report prepared in terms of the Regulations must contain-

- (a) details of-
  - (i) the specialist who prepared the report; and
  - (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;
- (b) a declaration that the specialist is independent in a form as may be specified by the competent authority;
- (c) an indication of the scope of, and the purpose for which, the report was prepared;
  - (cA) an indication of the quality and age of base data used for the specialist report
  - (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
- (d) the duration date and season of the site investigation and the relevance of the season to the outcome of the assessment;
- (e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modeling used;
- (f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;
- (g) an identification of any areas to be avoided, including buffers;
- (h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;
- (i) a description of any assumptions made and any uncertainties or gaps in knowledge;
- (j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
- (k) any mitigation measures for inclusion in the EMPr;
- (l) any conditions for inclusion in the environmental authorisation;
- (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
- (n) a reasoned opinion-
  - (i) whether the proposed activity, activities or portions thereof should be authorised; and (considering impacts and expected cumulative impacts).
  - (iA) regarding the acceptability of the proposed activity or activities, and
  - (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;
- (o) a description of any consultation process that was undertaken during the course of preparing the specialist report;
- (p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
- (q) any other information requested by the competent authority.

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<sup>1</sup> Not all requirements have to be complied with for the Scoping Report, however the EIA Report should fully comply with the requirements

## Scoping Report Requirements

The purpose of the Scoping Report is to identify and evaluate the main issues and potential impacts of the proposed project at a desktop level based on existing information. The scoping report must be updated in terms of the EIA Regulations of 2014, as amended on 07 April 2017 and as per Savannah Environmental's requirements and should:

- » Identify potential sensitive environments and receptors that may be impacted on by the proposed facility and the types of impacts (i.e. direct, indirect and cumulative<sup>2</sup>) that are most likely to occur.
- » Provide an evaluation of the expected significance of identified impacts (including nature, extent, significance, consequence, duration and probability of the impacts including the degree to which these impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated)
- » Identify sensitive and 'No-Go' areas, where applicable.
- » Summarise the potential impacts that will be considered further in the EIA Phase through specialist assessments.

The scoping report must include:

- » a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- » a description and evaluation of environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) that have been identified
- » Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the Scoping Report in terms of the following criteria:
  - \* the nature, which shall include a description of what causes the effect, what will be affected and how it will be affected, for each impact anticipated;
  - \* the extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. See Table on the next page.
- » a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- » a comparative evaluation of the identified feasible alternatives, and nomination of a preferred alternative for consideration in the EIA phase
- » Identification of potentially significant impacts to be assessed within the EIA phase and details of the methodology to be adopted in assessing these impacts. This should be detailed enough to include within the Plan of Study for EIA and must include a description of the proposed method of assessing the potential environmental impacts associated with the project. This must also include any gaps in knowledge at this point of the study and further recommendations for the EIA Phase. Consideration of areas that would constitute "acceptable and defensible loss" should be included in this discussion.

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<sup>2</sup> The cumulative impacts are expected to be associated with the scale of the project and any existing impacts affecting the study area. Cumulative effects can only be assessed once the detailed layouts are known. They will then be considered in the detailed specialist studies to be undertaken in the EIA Phase.

Scoping of impacts must be summarised in the following table format. The rating values as per the above criteria must also be included. Complete a table and associated ratings for each impact identified during the scoping study.

*Example of Impact table summarising the evaluation of Potential Impacts Associated with the Construction of the Facility at the Scoping phase*

<b>Impact</b> Description of the expected impacts. Areas anticipated to be affected.			
<b>Desktop Sensitivity Analysis of the Site:</b> Sensitivity analysis in terms of the impacts expected. Discuss areas of high concern.			
Issue	Nature of Impact	Extent of Impact	No-Go Areas
i.e. Disturbance to and loss of indigenous natural vegetation	Discussion of the consequences of the construction of the facility to the issue/impact considered in column 1.	i.e. Local/Regional/ National	No-Go areas would include the larger drainage lines, and Duneveld.
<b>Description of expected significance of impact</b> Describe expected significance, consequence, duration and probability of the impacts as well as degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated			
<b>Gaps in knowledge &amp; recommendations for further study</b>			

### EIA Report Requirements

The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase of the proposed projects. This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase. The EIA report should be updated in terms of the EIA Regulations of 2014, as amended on 07 April 2017 and Savannah Environmental's requirements.

The EIA report must consider the latest layout provided and should include:

- » a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- » a description and evaluation of environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) that have been identified

- » Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the EIA Report in terms of the following criteria:
  - \* the nature, which shall include a description of what causes the effect, what will be affected and how it will be affected;
- » a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- » a comparative evaluation of the identified feasible alternatives, and nomination of a preferred alternative
- » Any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation
- » This must also include any gaps in knowledge at this point of the study. Consideration of areas that would constitute "acceptable and defensible loss" should be included in this discussion.
- » A reasoned opinion as to whether the proposed project should be authorised.
- » Summary of the positive and negative impacts and risks of the proposed project and identified alternatives.
- » Mitigation measures and management recommendations to be included in the Environmental Management Programme to be submitted with the FEIR

#### **Assessment of Impacts**

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

- » The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- » The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- » The duration, wherein it will be indicated whether:
  - \* the lifetime of the impact will be of a very short duration (0-1 years) – assigned a score of 1;
  - \* the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - \* medium-term (5-15 years) – assigned a score of 3;
  - \* long term (> 15 years) - assigned a score of 4; or
  - \* permanent - assigned a score of 5;
- » The magnitude, quantified on a scale from 0-10, where a score is assigned:
  - \* 0 is small and will have no effect on the environment
  - \* 2 is minor and will not result in an impact on processes
  - \* 4 is low and will cause a slight impact on processes
  - \* 6 is moderate and will result in processes continuing but in a modified way
  - \* 8 is high (processes are altered to the extent that they temporarily cease)
  - \* 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- » The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

- » the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- » the **status**, which will be described as either positive, negative or neutral.
- » the **degree** to which the impact can be reversed.
- » the **degree** to which the impact may cause irreplaceable loss of resources.
- » the **degree** to which the impact can be mitigated.

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

$$S=(E+D+M)P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

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

- » < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area).
- » 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated).
- » > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Assessment of impacts must be summarised in the following table format. The rating values as per the above criteria must also be included. Complete a table and associated ratings for each impact identified during the assessment.

*Example of Impact table summarising the significance of impacts (with and without mitigation)*

<b>Nature:</b> [Outline and describe fully the impact anticipated as per the assessment undertaken]		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	High (3)	Low (1)
<b>Duration</b>	Medium-term (3)	Medium-term (3)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Probability</b>	Probable (3)	Probable (3)
<b>Significance</b>	<b>Medium (36)</b>	<b>Low (24)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	Yes
<b>Mitigation:</b>		

"Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.

**Cumulative impacts:**

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities<sup>3</sup>.

**Residual Risks:**

"Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014).

### Assessment of Cumulative Impacts

As per DEA's requirements, specialists are required to assess the cumulative impacts. In this regard, please refer to the methodology below that will need to be used for the assessment of Cumulative Impacts.

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities<sup>4</sup>.

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- » Unacceptable risk
- » Unacceptable loss
- » Complete or whole-scale changes to the environment or sense of place
- » Unacceptable increase in impact

The specialist is required to conclude if the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

<sup>3</sup> Unless otherwise stated, all definitions are from the 2014 EIA Regulations, GNR 326.

<sup>4</sup> Unless otherwise stated, all definitions are from the 2014 EIA Regulations, as amended, GNR 326

**Example of a cumulative impact table:**

*Nature:* Complete or whole-scale changes to the environment or sense of place (example)

<i>Nature:</i> [Outline and describe fully the impact anticipated as per the assessment undertaken]		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
<i>Extent</i>	Low (1)	Low (1)
<i>Duration</i>	Medium-term (3)	Long-term (4)
<i>Magnitude</i>	Minor (2)	Low (4)
<i>Probability</i>	Improbable (2)	Probable (3)
<i>Significance</i>	Low (12)	Low (27)
<i>Status (positive or negative)</i>	Negative	Negative
<i>Reversibility</i>	High	Low
<i>Irreplaceable loss of resources?</i>	Yes	Yes
<i>Can impacts be mitigated?</i>	Yes	Yes
<i>Confidence in findings:</i> High.		
<i>Mitigation:</i> "Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible. Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.		
<i>Residual Risks:</i>		

**Environmental Management Plan Table format**

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

OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

<b>Project component/s</b>	List of project components affecting the objective	
<b>Potential Impact</b>	Brief description of potential environmental impact if objective is not met	
<b>Activity/risk source</b>	Description of activities which could impact on achieving objective	
<b>Mitigation: Target/Objective</b>	Description of the target; include quantitative measures and/or dates of completion	
<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>

List specific action(s) required to meet the mitigation target/objective described above	Who is responsible for the measures	Time periods for implementation of measures
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<b>Performance Indicator</b>	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
<b>Monitoring</b>	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting

Please see the next page for an example of how the mapping should be updated to indicate the feature and the sensitivity of the feature.