



**Appendix 6E**  
**Heritage Assessment**  
**(Including Paleontology, Archaeology &**  
**Cultural Landscape)**



21 February 2019

SiVEST Environmental  
P O Box 2921  
Rivonia 2128

Attention: Liandra Scott-Shaw

**HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY, (WEF) BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE (DEA REF: 14/12/16/3/3/2/1115)**

Our report reflected in the title above dated 20 October 2018, refers.

PGS Heritage noted the proposed change in the turbine capacity from between 3MW and 6.5MW to be up to 8MW do not affect any of our findings contained in our report.

The overall impact rating reflected in the report, HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED 325 MW RONDEKOP WIND ENERGY FACILITY, (WEF) BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE, dated 20 October 2018, **is not** affected by the following proposed changes:

- All turbines are still valid (slight alignment shifts mainly to turbine 16 [ecology changes] 44 [to avoid the 200m bat and bird buffer surrounding the watercourse]).
- Turbine 25 access road to crane pad: minor alignment change as the current alignment was very close to the edge of the ridge and ecologist was concerned about downslope erosion).
- Turbine 27 access road: minor alignment shift to avoid crossing a rocky ridge / outcrop as per the ecology requirement.
- Road between turbine 28 & 29: minor alignment change to avoid rocky outcrop.
- Crane pad 29 & 35: minor alignment change to avoid the rocky outcrops.
- Access road north 1: shifted the alignment slightly away from the drainage line and then crossing it perpendicularly at a single point.
- Access road 2: shifted to only cross the drainage line at one point.
- Construction Camp 1: shift to follow road alignment.

Any queries can be referred to, Wouter Fourie, at [wouter@pgsheritage.co.za](mailto:wouter@pgsheritage.co.za)

Regards



Wouter Fourie

Director (*Accredited professional Heritage Practitioner – APHP, Accredited Professional Archaeologist – ASAPA*)

PGS Heritage



## **RONDEKOP WIND FARM (PTY) LTD**

### **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN SUTHERLAND IN THE NORTHERN CAPE PROVINCE**

# Heritage Impact Assessment

**Issue Date:** 10 September 2018  
**Revision No.:** 0.1  
**Project No.:** 339HIA

## Declaration of Independence

I, Ilan Smeyatsky,

as the appointed independent noise specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study 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.

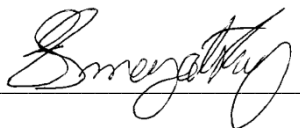
### Disclosure of Vested Interest

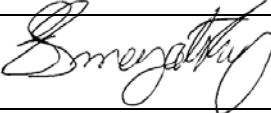



I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

**HERITAGE CONSULTANT:** PGS Heritage (Pty) Ltd

**CONTACT PERSON:** Ilan Smeyatsky - Archaeologist  
Tel: +27 (0) 12 332 5305  
Email: Ilan@pgsheritage.co.za

**SIGNATURE:**



<b>Report Title</b>	<b>ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN SUTHERLAND IN THE NORTHERN CAPE PROVINCE: HERITAGE IMPACT ASSESSMENT</b>		
<b>Control</b>	<b>Name</b>	<b>Signature</b>	<b>Designation</b>
<b>Author</b>	Ilan Smeyatsky		Archaeologist/ PGS Heritage
<b>Co-author</b>	Marko Hutten		Archaeologist/PGS Heritage
<b>Reviewed</b>	Wouter Fourie		Principal Heritage Specialist
<b>Reviewed</b>	Andrea Gibb		SiVest/Environmental Division

<b>Date:</b>	<i>07 11 2018</i>
<b>Document Title:</b>	Heritage Impact Report
<b>Author:</b>	<i>Ilan Smeyatsky, Marko Hutten, Wouter Fourie</i>
<b>Revision Number:</b>	<i>0.3</i>
<b>Checked by:</b>	<i>Andrea Gibb</i>
<b>For:</b>	<i>SiVEST SA (PTY) Ltd</i>

The heritage impact assessment report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

<b>Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017</b>	<b>Relevant section in report</b>
1.(1) (a) (i) Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to <b>Appendix D</b>
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	Section 1.1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 1.1
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3.6
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3.6 and <b>Appendix B</b>
(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;	Section 3.6 and 5
(g) An identification of any areas to be avoided, including buffers	Section 5
(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;	Section 3.6
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 5
(k) Any mitigation measures for inclusion in the EMPr	Section 5
(l) Any conditions for inclusion in the environmental authorisation	Section 5
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 5
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 5 and 6
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(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	Section 6

**CLIENT NAME:** RONDEKOP WIND FARM (PTY) LTD  
**Project Description:** Rondekop WEF

**prepared by:** PGS for SiVEST

**Revision No. 0**  
 14 December 2018

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(o) A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
(p) A summary and copies if any comments that were received during any consultation process	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs promulgated through a governmental notice.



As per the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” The compliance of this HIA to these standards is described in below.

Standards	Compliance
<p><b>A. Title Page</b> with:</p> <p>A Title that identifies this report. It should give the name and geographical location of the site(s) and/ or project, including property or farm name (and magisterial district) and province;</p> <p>Author(s) surname(s) and details, company name and contact details;</p> <p>Developer and consultant’s name (who commissioned the report), postal address, telephone and fax numbers;</p> <p>Date of report (including day and month).</p>	Page iii
<p><b>B. Executive Summary</b> including:</p> <p>The purpose of the study;</p> <p>A brief summary of the findings;</p> <p>The recommendations; and</p> <p>Any stakeholders or people responsible for decisions and actions.</p>	Page vi
<p><b>C. Table of Contents</b>, for reports longer than 10 pages.</p>	Page xi - xv
<p><b>D. Background Information</b> on the Project with:</p> <p>Whether the report is part of a scoping report/ EIA/ HIA or not;</p> <p>Type of development (e.g. low cost housing project, mining);</p> <p>Whether re-zoning and/or subdivision of land is involved;</p> <p>Developer and consultant and owner and name and contact details;</p> <p>Terms of Reference;</p> <p>Legislative requirements.</p>	Section 1 and Section 2
<p><b>E. Background to the Archaeological and Palaeontology History</b> and other relevant heritage components of the area with,</p> <p>Literature review or archival research sufficient to place the sites located in context;</p> <p>Reference to museum or university databases and collections;</p> <p>Previous relevant impact assessment reports for the area.</p>	Section 3.2 and section 3.3
<p><b>F. Description of the Property or Affected Environment</b> its setting and heritage resources, with:</p> <p>Details of the area surveyed including;</p> <p>Full Location Data for Province, Magisterial District/Local Authority and property (e.g. farm/erf) name and number, etc.;</p> <p>Location Map(s)/ orthophotos of the general area. These must include the map name and number (e.g. 3318DC Bellville). Maps must include at least a 1:50 000 and (if available) also a 1:10 000 (i.e. most detailed possible). Large scale colour satellite photos make a useful addition. Maps should be preferably at least A4 in size.</p> <p>Either the Location Map or the Site Map must have the polygon of the area surveyed marked on it and full geographical co-ordinates for all relevant points and,</p>	Section 3.4  Section 2

<p>where applicable, indication of the area to be developed (footprint). The report or map must indicate exactly what area was searched, and if any area was not searched why this was so; and what the probability is of sites being found there.</p> <p>Description of the methodology used including: How the area was searched (e.g. a three-person team for two days, and whether on foot or not!) and what, if any, sampling techniques were used;</p> <p>What the restrictions to the study were, for example: visibility affected by high grass or bush or vegetation cover, walls or concrete surfaces; physical or other impediments (e.g. vlei, swamp, steep kloof, mobile dune) to the assessment of the area; How the data was acquired, and details of research equipment (e.g. GPS).</p>	<p>Section 3.6</p> <p>Section 1.4</p>
<p><b>G. Description of Sites</b> identified and mapped with: Details of the location of all the sites including: Site Map or aerial photograph of the specific area with the location of all sites marked on it. Make it clear how this relates to the Location Map described above (7.1Fii). GPS readings with the model and datum used (WGS 84 is considered the most useful). Please comment on the accuracy. If co-ordinates are read off the 1:50 000 map, please indicate this. Wherever possible the GIS track actually surveyed should be mapped. An adequate description of each site including: Type of site (e.g. open scatter; shell midden, cave/shelter); Site categories (e.g. Earlier Stone Age, Late Iron Age); Context (detailed description of depositional history and environment); iv. Cultural affinities, approximate age and significant features of the site; v. Estimation or measurement of the extent (maximum dimensions) and orientation of the site(s); Depth and stratification of the site (where shovel test permits have been given or natural exposures available), both in the text and through photographs of sections; vii. Possible sources of information about past environments, such as stalagmites/stalagmites, flowstone, dassie middens, peat or organic rich deposits and natural bone accumulations;and viii. Photographs and diagrams, of good quality, with a centimetre scale (e.g. for artefacts) or metre scale (e.g. for large scale village plan) and a caption. Include a 'wide angle' photo of the sites. Threats or sources of risk and their impact on the heritage resources (e.g. earth moving, traffic of vehicles or humans, erosion). If the sites are in KwaZulu-Natal or the Northern Cape please apply to the old Archaeological Data Recording Centres at the Provincial Museums for National Site Numbers (for sites that will be conserved, excavated or collected).</p>	<p>Section 4.1 to 4.3</p>
<p><b>H. Description of the Artefacts, Faunal, Botanical or Other Finds and Features</b> for each site.</p>	<p>Section 4.1</p>

<p>Record meaningful information and consider supplying:</p> <p>Raw material, type, maximum dimensions and relative frequency of and significant attributes of stone tools observed on the surface;</p> <p>Basic description of ceramics, other artefacts and occurrences such as rock art;</p> <p>Description of features (e.g. hearths, bedding, walling);</p> <p>Basic description of faunal or botanical taxa and estimated frequencies;</p> <p>Adequate photographic and graphic representations (with scale in centimetres); and crossreference photographs with a map showing where the objects in the photographs were found;</p> <p>Location of repositories at which artefacts, photographs, rock art tracings and field records (from other sites in the area) are kept.</p>	
<p><b>I. Clear Description of Burial Grounds and Graves</b> with:</p> <p>Clear written and photographic description of any graves;</p> <p>Exact or estimated age and affinities of the burials;</p> <p>Clear discussion for the client of the legal implications (include reference to both the Act and the regulations for s.363 , and particularly the public participation process, and whether this should be done by the archaeologist or may be better done by a social consultant).</p>	N/A – no graves were found
<p><b>J. Field Rating</b> (Recommended grading or field significance) of the site:</p> <p>While grading is actually the responsibility of the heritage resources authorities, all reports should include Field Ratings for the site(s) discussed (proposals for grading), to comply with section 38 of the national legislation, for example:</p> <p>National: This site is considered to be of Field Rating/Grade I significance and should be nominated as such (mention should be made of any relevant international ranking);</p> <p>Provincial: This site is considered to be of Field Rating/Grade II significance and should be nominated as such;</p> <p>Local: this site is of Field Rating/Grade IIIA significance. The site should be retained as a heritage register site (High significance) and so mitigation as part of the development process is not advised;</p> <p>Local: this site is of Field Rating/Grade IIIB significance. It could be mitigated and (part) retained as a heritage register site (High significance);</p> <p>'General' Protection A (Field Rating IV A): this site should be mitigated before destruction (usually High/Medium significance);</p> <p>'General' Protection B (Field Rating IV B): this site should be recorded before destruction (usually Medium significance);</p> <p>'General' Protection C (Field Rating IV C): this site has been sufficiently recorded (in the Phase 1). It requires no further recording before destruction (usually Low significance).</p>	Section 4.1
<p><b>K. Statement of Significance</b> (Heritage Value) giving the significant archaeological heritage value of relevant sites in terms of the legislation (NHRA, section 3 (3) listed below) or any other relevant criteria, and give reasons.</p> <p>a. its importance in the community, or pattern of South Africa's history;</p>	Section 5

<p>its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;</p> <p>its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;</p> <p>its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;</p> <p>its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;</p> <p>its importance in demonstrating a high degree of creative or technical achievement at a particular period;</p> <p>its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;</p> <p>its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and</p> <p>sites of significance relating to the history of slavery in South Africa.</p>	
<p>L. <b>Recommendations</b> including:</p> <p>An assessment of the potential impact of the development on these sites, relative to sustainable social and economic benefits;</p> <p>Proposals for protection or mitigation relating to:</p> <p>Possible alternatives in the development that might allow the protection and conservation of the sites; or</p> <p>The need for mitigation of adverse impacts; or</p> <p>The need to conserve certain sites because of their high heritage value.</p> <p>Detailed recommendations with regard to burial grounds and graves. This must inform the client about the full process and enable the heritage authority to make decisions about permits. This must include:</p> <p>Recommendations for protection of the grave(s) during the development and in the long term, e.g. fencing and plans for maintenance (mini-management plan); OR</p> <p>Recommendations for relocation of the grave(s), public participation and possibly further archival research, or both (i &amp; ii).</p> <p>An indication of what must be done at each site:</p> <p>If the site is of Low4 Significance (see Kg above) the recommendation may be that the site must be mapped, documented and then destroyed (with a permit / letter of permission / Record of Decision from the heritage authority);</p> <p>if the site is of Medium5 Significance the recommendation may be for a measure of mitigation after which the site may be destroyed. Mitigation usually involves a requirement to collect or excavate a sample of the cultural and other remains that will adequately allow characterization and dating of the site. (The archaeologist will require a permit for the excavation and collection. If, after this mitigation significant archaeological residues or parts of sites remain, the archaeologist should request the developer to apply for a permit for destruction or fill in the application for them to sign! In this way the heritage resources authority can help the archaeologist ensure that the recommended mitigation takes place;</p>	<p>Section 6</p>

<p>If the site is of High Significance the recommendation may be that it be formally graded and conserved (with. provision of boardwalks, fencing, signage, guides) and protected as a heritage resource (either being listed on the Heritage Register or being declared as a Provincial or National Heritage Site). If sites are to be protected a Site Management Plan should be required. For mini-plans, where small sites are incorporated into developments, this must include an indication of who is responsible for maintenance and how this process will be monitored.</p>	
<p>M. Conclusions.</p>	<p>Section 6</p>
<p>N. Bibliography detailing citations in the text of the report. Remember that all sources should be adequately acknowledged (even the web).</p>	<p>Section 7</p>
<p>O. Appendices if any.</p>	<p>Appendices A-E</p>

## EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd was appointed by SiVEST SA (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) for the development of a Wind Energy Facility (WEF) and associated infrastructure, on parts the following farms:

- Remainder and Portion 1 of the Farm Roodeheuvel 170;
- Remainder and Portion 1 of the Farm Wind Heuvel 190;
- Remainder and Portion 1 of the Farm Bloem Fontein 192;
- Portion 1 and 2 of the Farm Urias Gat 193;
- Remainder, Portion 1 and 3 of the Farm Venters Kraal 166;
- Farm Ashoek 224;
- Remainder of the Farm 220;
- Portion 1 of the Farm Lange Huis 174;
- Remainder of the Farm Vinke Kuil 171; and
- Farm Zeekoegat 169.
- Remainder of the Farm Hout Hoek 191

The proposed development is situated approximately 45km south west of Sutherland in the Karoo Hoogland Local Municipality in the Namakwa District Municipality within the Northern Cape Province.

Heritage resources are unique and non-renewable and as such any impact on such resources must be viewed significant.

Due to the nature of cultural remains, a systematic controlled-exclusive surface survey was conducted on foot and in a vehicle, over a period of four days by two archaeologists from PGS. The fieldwork was conducted on the 20<sup>th</sup>-24<sup>th</sup> September 2018. An additional site assessment was also conducted by a Palaeontologist from Banzai Environmental on the 1<sup>st</sup> – 3<sup>rd</sup> October 2018. The locations of five (5) individual heritage sites were identified during the field survey, all of them falling within the boundaries of the study area.

### Archaeology

The archaeological resources identified within the proposed development site comprise a small number of Stone Age surface artefact scatters. These are primarily

from the Later Stone Age (LSA), although Middle Stone Age (MSA) material was also identified. All these artefact assemblages occur in heavily deflated and eroded areas, so their scientific potential and heritage significance is somewhat lowered. Based on findings from a range of other heritage reports in the area, these types of sites are to be expected in this region.

The remaining heritage features included buildings and stone walled structures that are likely the result of early European settlement in the area. Most of these features are likely over 60 years of age and for this reason are protected by current heritage law.

Even though heritage features were detected within the development area, serious mitigation measures will not be required except for the implementation of a chance-finds protocol. However, if the development layout is altered, this position will need to be reevaluated.

### **Palaeontology**

The proposed Rondekop development site is underlain by the Abrahamskraal Formation (Adelaide Subgroup, lower Beaufort Group, of the Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup). According to the PalaeoMap on SAHRIS the Abrahamskraal and Waterford Formations have very high Palaeontological sensitivities while the Ecca has a moderate Palaeontological Sensitivity (Almond and Pether 2008, SAHRIS website).

A site-specific field survey of the development footprint were conducted on foot and by motor vehicle from the 1<sup>st</sup> - 3<sup>rd</sup> October 2018. Access to all of the locations of the proposed site proved to be difficult. However, as many as possible of the proposed infrastructure locations were investigated. Exposed rock layers were visually inspected but there were no visible evidence of fossiliferous outcrops. For this reason, an overall **low palaeontological sensitivity** is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Rondekop WEF development will be of a **low significance** in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the **construction of the development**

**may be authorised in its whole extent**, as the development footprint is not considered sensitive in terms of palaeontological resources.

**The proposed development, as well as all alternatives have a similar geology and therefore there is no preferences on the grounds of palaeontological fossil heritage for any specific layout among the different options under consideration.**

The different options include the on-site substation, construction yards, the access roads to the ridges and turbine layouts along with proposed associated infrastructure. As impacts on fossil heritage usually only occur during the excavation phase and no further impacts on fossil heritage are expected during the operation and decommissioning phases of the WEF.

### **Cultural Landscape**

The visual assessment completed by Gibb et al (2018) for the Rondekop WEF characterised the study area as a *“typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa.”*

They do however find that visual impacts on the cultural landscape would be reduced by the fact that the area is very remote and there are no significant tourism enterprises attracting visitors into the study area. In addition, the nearest major scenic route, the R354, is outside the 8km visual assessment zone and is not expected to experience any visual impacts from the proposed WEF.

The cultural landscape in this area is therefore considered to be of low significance and the impacts on the cultural landscape of low significance.

### **General**

In the event that heritage resources are discovered during site clearance, construction activities must stop in the immediate vicinity of the find, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

The overall impact of the WEF and its associated infrastructure, on the heritage resources identified during this report, is seen as low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised. There are no preferences in terms of



the proposed layout alternatives as none of them will affect known heritage resources thus no mitigation measures will be required, except for the implementation of a chance-finds protocol. However, if the development layout is altered, this position will need to be reevaluated.

## Impact ratings summary

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Stone Age Heritage	Development	-16		-15	
Colonial Structures	Development	-16		-15	
Monuments (memorials)	Development	-16		-15	
Cumulative Impact	Destroy heritage resources such as archaeological or historical sites	-18		-18	
	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-16	Negative low Impact	-14	Negative low Impact
Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the	-14	(negative low)	-12	(negative low)

**CLIENT NAME:** G7 Renewables (PTY) LTD

**Project Description:** Rondekop WEF

**Revision No.** 0

14 December 2018

**prepared by:** PGS for SiVEST

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
	ground surface that are then no longer available for scientific study				
Impact associated with the no-go alternative	<p>Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study</p> <p>Destroy heritage resources such as archaeological or historical sites</p>	Neutral	Neutral	Neutral	Neutral

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## **TERMINOLOGY AND ABBREVIATIONS**

### **Archaeological resources**

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

### **Cultural significance**

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

### **Development**

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

### **Earlier Stone Age**

The archaeology of the Stone Age between ~300 000 and 3 300 000 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 (Act 25 of 1999)).

## **Heritage resources**

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

## **Holocene**

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

## **Later Stone Age**

The archaeology of the last 30 000 years associated with fully modern people.

## **Late Iron Age (Early Farming Communities)**

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

## **Middle Stone Age**

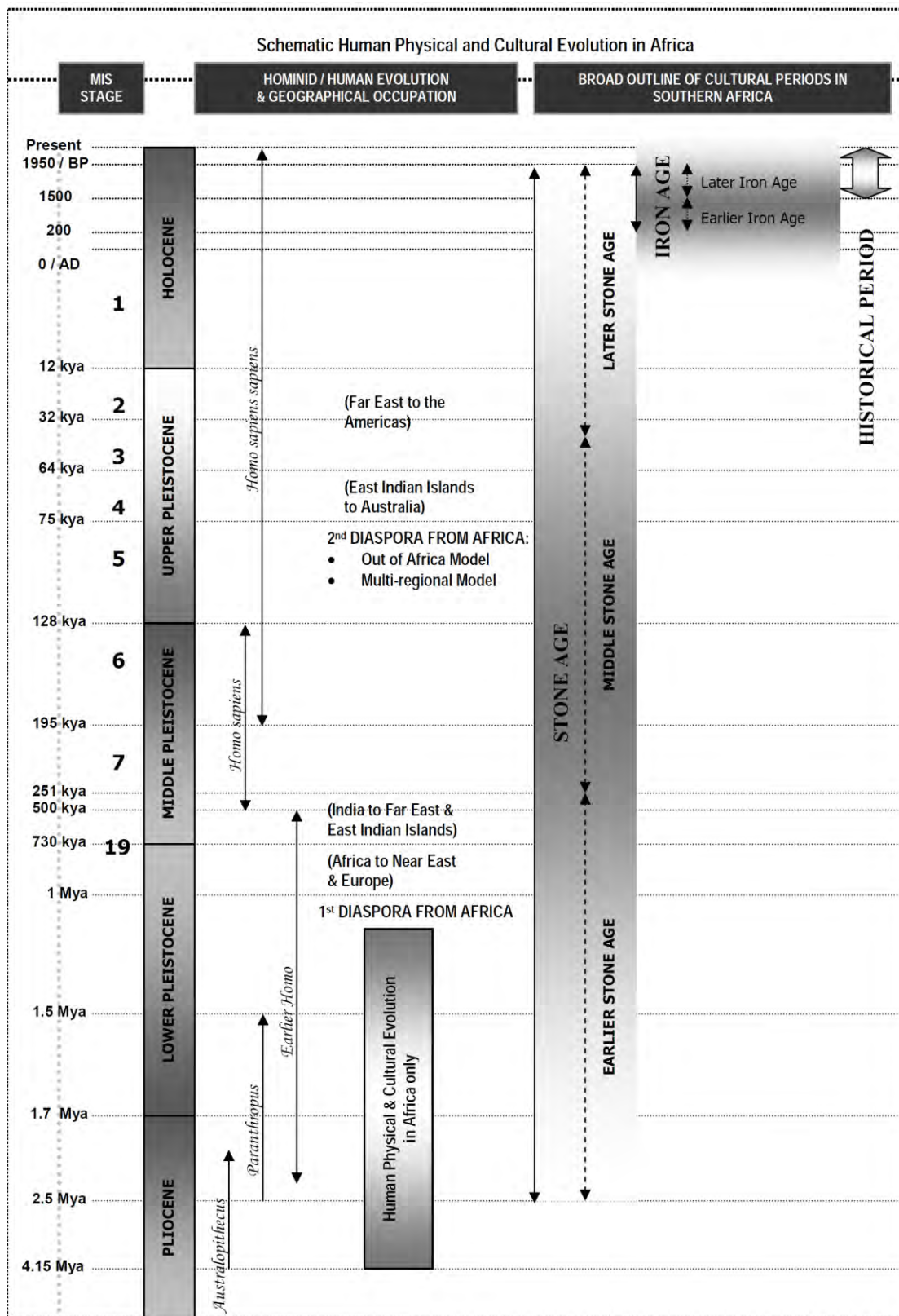
The archaeology of the Stone Age between 30 000 - 300 000 years ago, associated with early modern humans.

## 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.

### List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
OES	Ostrich eggshell
LCT	Large Cutting Tool



**Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)**

# 1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by SiVEST SA (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) for the development of the Rondekop Wind Energy Facility (WEF) and associated infrastructure (proposed development) on the following Farms:

- Remainder and Portion 1 of the Farm Rondeheuvel 170;
- Remainder and Portion 1 of the Farm Wind Heuvel 190;
- Remainder and Portion 1 of the Farm Bloem Fontein 192;
- Portion 1 and 2 of the Farm Urias Gat 193;
- Remainder, Portion 1 and 3 of the Farm Venters Kraal 166;
- Farm Ashoek 224;
- Remainder of the Farm 220;
- Portion 1 of the Farm Lange Huis 174;
- Remainder of the Farm Vinke Kuil 171; and
- Farm Zeekoegat 169.
- Remainder of the Farm Hout Hoek 191

The proposed development is situated approximately 45 km south-west of Sutherland in the Karoo Hoogland Local Municipality in the Namakwa District Municipality within the Northern Cape Province.

## 1.1 Scope of the Study

The aim of the study is to identify possible heritage resources and finds that may occur in the proposed development area. The HIA aims to assist the developer in managing the discovered heritage resources in a responsible manner, to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

## 1.2 Terms of Reference

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements;

- Provide a thorough overview of all applicable legislation, guidelines
- Cumulative impact identification and assessment as a result of other renewable energy (RE) developments in the area (including; a cumulative environmental impact table(s) and statement, review of the specialist reports undertaken for other Renewable Energy developments and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered);
- Identification sensitive areas to be avoided (including providing shapefiles/kmls);
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
  - Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
  - Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
  - Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
- Comparative assessment of alternatives (infrastructure alternatives have been provided):
  - Recommend mitigation measures in order to minimise the impact of the proposed development; and
  - Implications of specialist findings for the proposed development (e.g. permits, licenses etc).

Specific requirements:

- Describe and map the heritage features of the site and surrounding area. This is to be based on desk-top reviews, fieldwork, available databases, and findings from other heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded.
- Assess the impacts and provide mitigation measures to include in the environmental management plan
- Map heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e. “very high” sensitivity) and provide recommended buffers or set-back distances.

- Identify and assess potential impacts from the project on the full scope of heritage features, including archaeology, palaeontology and the cultural-historical landscape, as required by heritage legislation.
- Liaise with the relevant authority in order to obtain a final comment in terms of section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), including Regulations issued thereunder, as necessary.
- Load the relevant documents on the South African Heritage Resources Information System (SAHRIS) to obtain a comment from SAHRA.

### 1.3 Specialist Qualifications

This HIA Report was compiled by PGS.

The staff at PGS has a combined experience of nearly 70 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Mr. Ilan Smeyatsky, graduated with his Master's degree (MSc) in Archaeology; is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA) and is accredited as a Field Supervisor.

Mr. Marko Hutten, heritage specialist and Project Archaeologist, has 20 years of experience in the industry and is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Field Director.

Mr. Trent Seiler completed his Masters in 2017 focussing on Later Stone Age in the northern parts of the Limpopo Province. He recently joined PGS as a Field Technician and wishes to have a career in Heritage Management as a Heritage Practitioner.

Elize Butler, palaeontologist, has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 12 years. She has been conducting Palaeontological Impact Assessments since 2014.

Mr. Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

#### **1.4 Assumptions and Limitations**

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMP Reports) for the surrounding developments, however many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

#### **1.5 Legislative Context**

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA), Act 107 of 1998
- National Heritage Resources Act (NHRA), Act 25 of 1999
- Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- National Environmental Management Act (NEMA) Act 107 of 1998 – Regulation 326 (7 April 2017)
  - Basic Environmental Assessment (BEA) – Appendix 1 s (2)(d)
  - Environmental Scoping Report (ESR) – Appendix 1 s (3)(h)(iv) and Appendix 2 s(2)(g)(iv)
  - Environmental Impact Assessment (EIA) – Appendix 3 s (3)(h)(iv)/
- National Heritage Resources Act (NHRA) Act 25 of 1999
  - Protection of Heritage Resources – Sections 34 to 36; and
  - Heritage Resources Management – Section 38
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
  - Section 39(3)

The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

## **2 TECHNICAL DETAILS OF THE PROJECT**

### **2.1 Locality**

The proposed development is situated in the Karoo Hoogland Local Municipality in the Namakwa District Municipality within the Northern Cape Province. The relevant properties for the proposed Rondekop WEF development is situated approximately 45km south west of the town of Sutherland (**Figure 2**).



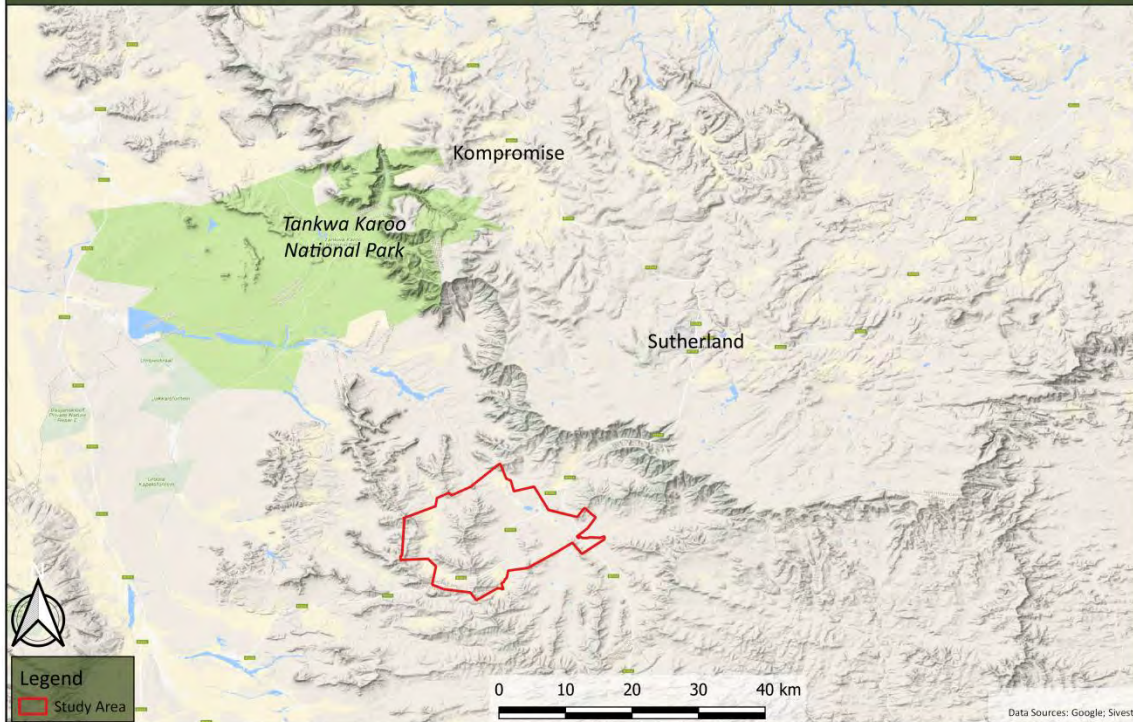


Figure 2 – Locality of study area

## 2.2 Technical Project Description

The following project background and technical description has been supplied by SiVEST:

Rondekop Wind Farm (Pty) Ltd proposes to develop a Wind Energy Facility (WEF) of up to 325 megawatt (MW), 45 km south-west of Sutherland, in the Northern Cape Province, South Africa. The proposed facility is located within the Karoo Hoogland Local Municipality, which fall within the Namakwa District Municipality.

The Rondekop WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW) (**Figure 3**), and will include the following:

- Up to 48 wind turbines, each between 3MW and 6.5MW in nameplate capacity each with a foundation of up to 30 m in diameter and up to 5 m in depth.
- The hub height of each turbine will be between 90 m and up to 140 m and its rotor diameter between 100 m and up to 180 m.

- Permanent compacted hardstanding laydown areas (also known as crane pads) for each wind turbine of 90 m x 50 m (total footprint 21.6ha) during construction and for ongoing maintenance purposes for the lifetime of the project.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2 m x 2 m but can be up to 10 m x 10 m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12 m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 73 ha. 38,6 ha will be upgrades to existing roads. Turns will have a radius of up to 50 m for abnormal loads (especially turbine blades) to access the various turbine positions.
- Access roads to the site will be approximately 9 m wide while access roads to the substation will be approximately 6 m wide.
- One 33/132kV onsite substation. The 33kV footprint will need to be assessed as part of the WEF EIA and the 132kV footprint will be assessed in a separate basic assessment (BA) process as the current applicant will remain in control of the low voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.
- Up to 4 (the height will be the same as the final wind turbine hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~13ha) which includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.
- Fencing will be limited around the construction camp and batching plant. The entire facility would not be fenced off. The height of fences around the construction camp are anticipated to be up to 6 m.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the DWS will be applied for separately.
- Application site ~37 543.13 hectares (cadastral units). The total footprint of the wind farm will however be ~ 114 ha (of which ~38ha will be upgrading of existing roads).

### 2.2.1 Road layout alternatives

Various access road alternatives are currently proposed to connect the R356 to the three ridges. The proposed access to the site is from the tarred R354 connecting Matjiesfontein and Sutherland, turning north-west onto R356 provincial gravel road and heading west from where the access roads branches off. The six (6) access road alternatives (two (2) per ridge) branch off the R356.

Considering that the proposed Rondekop WEF is to be developed on three (3) separate ridges, there are two (2) proposed access roads to each ridge, therefore six (6) access road alternatives in total.

Three access road alternatives would connect the public R356 road to the new wind farm road network between the turbines on the ridges namely:

#### 2.2.1.1 North ridge

- Access road alternative North 1, route is approximately 11.8 km in length, almost all of which comprises an existing farm road that will need to be upgraded; or
- Access road alternative North 2 is approximately 12.8 km in length and branches off the R356 and follows an existing farm road that will need to be upgraded.

#### 2.2.1.2 Centre ridge

- Access road alternative Centre 1 is approximately 2.6 km in length and branches off the R356 to the north and connects between turbine 31 and 32; or
- Access road alternative Centre 2 is approximately 3.1 km in length and branches off the R356 and connects to the site near turbine 28.

#### 2.2.1.3 Southern ridge

- Access road alternative South 1 is approximately 1.9 km in length and branches off the R356 to the south and connects near turbine 45; or
- Access road alternative South 2 is approximately 4.2 km in length and branches off the R356 to the south and connects near turbine 42.

All six (6) alternatives must be assessed with the road network and one access road per ridge would require environmental authorisation in order to enable access to all three ridges. The internal access roads are assessed as part of all access road alternatives.

Each road section will be buffered by approximately 200 m to allow for incremental alternatives i.e. reroute within the buffer in order to avoid any sensitive features identified during the detailed specialist assessments.

### 2.2.2 *Construction camps*

Six (6) alternative construction camp layouts, including the area required for a batching plant, will be assessed namely construction camp:

- Construction Camp Alternative 1 is located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction camp Alternative 2 is also located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction Camp Alternative 3 is located adjacent to and east of the R356 public road on the Remainder of farm 190 Wind Heuvel;
- Construction Camp Alternative 4 is located at the intersection of an existing 4x4 track and the R356 on portion 1 of farm 190 Wind Heuvel;
- Construction Camp Alternative 5, is located at the intersection of the R356, access road alternative centre 2 and access road alternative south 1 extending to the north on the remainder of farm 192 Bloem Fontein; and
- Construction Camp Alternative 6 is located to the west of access road alternative centre 2 north of the R356 on the remainder of farm 192 Bloem Fontein.

### 2.2.3 *Substations*

Six (6) onsite 33/132kV substation location alternatives were identified based on technical studies which considered aspects such as topography, earth works and levelling, environmentally sensitive features, electrical losses, turbine locations and existing agricultural use. All six (6) positions are located relatively in the centre of the facility.

- Substation alternative 1 is located south of turbine 22 on the remainder of farm 191 Hout Hoek;

- Substation alternative 2 is located south of substation alternative 1 on the remainder of farm 191 Hout Hoek;
- Substation alternative 3 is located south east of substation alternative 2 on the remainder of farm 190 Wind Heuvel;
- Substation alternative 4 is located north east of substation alternative 3 on the remainder of farm 190 Wind Heuvel;
- Substation alternative 5 is located west of construction camp alternative 4 along an existing 4x4 jeep track; and
- Substation alternative 6 is located adjacent to access road alternative center 1 to the east on portion 1 of farm 190 Wind Heuvel.

#### 2.2.4 *No-Go Alternative*

It is mandatory to consider the “no-go” option in the EIA process. The no development alternative option assumes the site remains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area and the status quo would proceed.

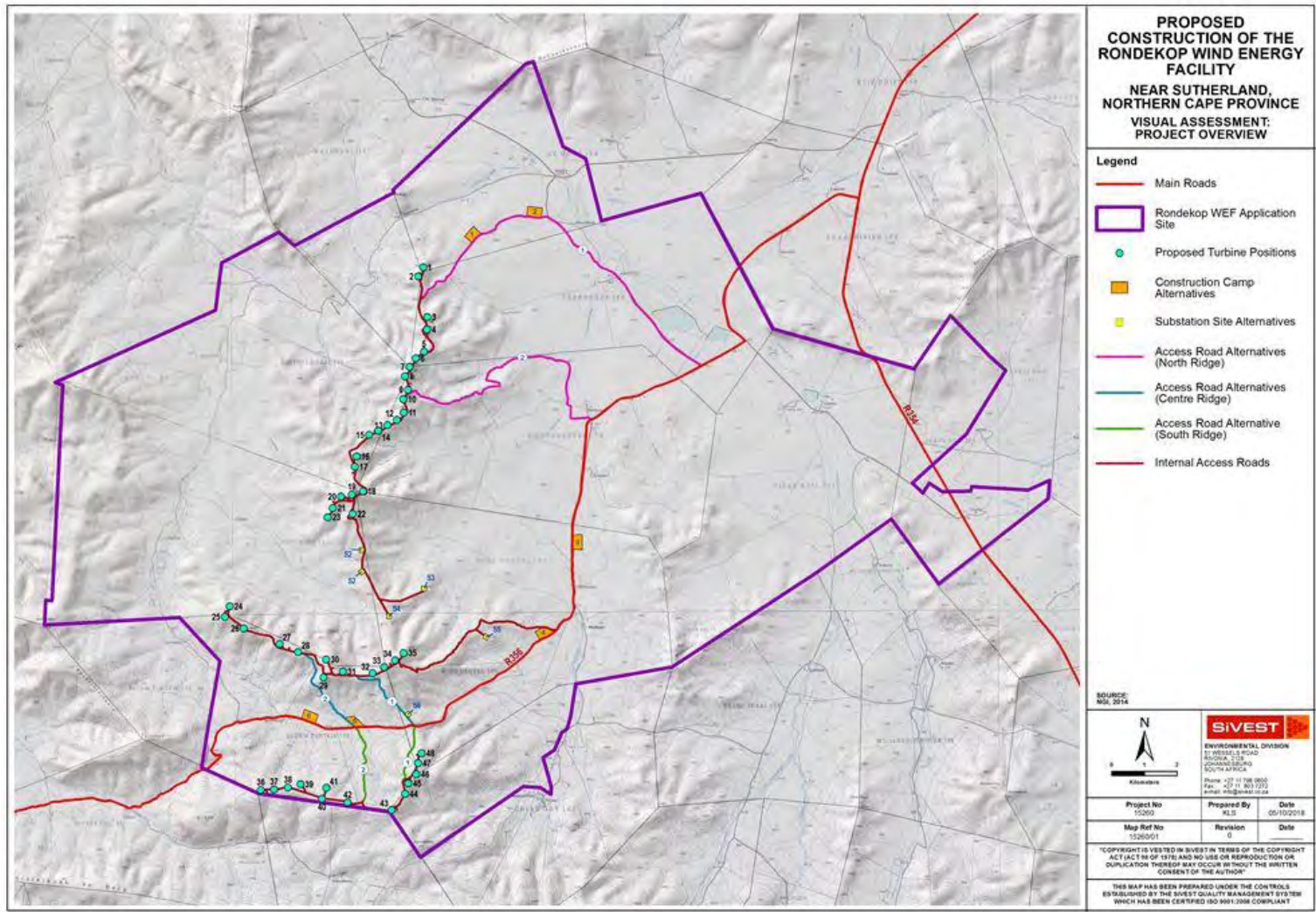


Figure 3 – Proposed Rondekop WEF turbine locations as well as associated infrastructure.

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prepared by: PGS for SIVEST

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The proposed facility is located partially within the Komsberg Renewable Energy Development Zone (REDZ 2), one of the eight REDZ formally gazetted<sup>1</sup> in South Africa indicating the procedure to be followed in applying for environmental authorisation (EA) for large scale solar and wind energy generation facilities. Considering that a portion of the proposed facility is located outside of the Komsberg REDZ, the Rondekop WEF will be subject to a full Environmental Impact Assessment (EIA) process in terms of the NEMA as amended and EIA Regulations, 2014 (as amended).

The proposed site was selected through an environmental and social pre-feasibility assessment commissioned by the applicant for several sites within the Roggeveld area.

This study was undertaken by CES in 2009 and included a high-level screening of potential environmental and socio-economic issues, as well as 'fatal flaws' to determine suitable areas for project development. The consideration of a number of criteria resulted in the selection of the site by the applicant.

Therefore, no further site location alternatives other than Rondekop will be considered in this process.

### **2.3 Study methodology**

The applicable maps, tables and figures are included, as stipulated in the NHRA (Act No 25 of 1999) and NEMA (Act No 107 of 1998). The HIA process consisted of three steps;

Step I – Literature Review - The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey - A physical survey was conducted predominantly by foot within the proposed areas by two qualified archaeologists and one palaeontologist, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of identified heritage sites is based on three main criteria -

1. Site integrity (i.e. primary vs. secondary context),
2. Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
3. Density of scatter (dispersed scatter)
  - Low - <10/50m<sup>2</sup>
  - Medium/High - 10-50/50m<sup>2</sup>
  - High - >50/50m<sup>2</sup>
  - Uniqueness; and
  - Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows -

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

Impacts on these sites by the development will be evaluated based on the assessment criteria described in **Appendix B** of this report.

### **3 CURRENT STATUS QUO**

#### **3.1 Site Description**

The proposed development site is situated approximately 45km south-west of the town of Sutherland, The proposed Rondekop WEF is situated in between the Klein Roggeveld Mountains to the south and the Roggeveld Mountains and Plateau to the north, covering approximately 37 646 ha (**Figure 2**).

The proposed development area is currently being used predominantly for agricultural purposes. It is situated approximately 5km to the west of the R354 tar road from Matjiesfontein to Sutherland. The area is largely undisturbed except for several fences which demarcate the individual properties; tracks which cross the properties, leading to several wind mill sites and an access road leading to a communications mast (**Figure 4, Figure 5 & Figure 6**).



The landscape comprises various ridges, valleys and surrounding plains (**Figure 7, Figure 8 & Figure 9**). The prevailing vegetation type and landscape features of the area form part of the Central Mountain Shale Renosterveld within the Fynbos Biome and the Koedoesberge-Moordenaars Karoo within the Succulent Karoo Biome (**Figure 10 & Figure 11**). The Central Mountain Shale Renosterveld is described as slopes and broad ridges of low mountains and escarpments, with tall shrub-land dominated by *Renosterbos* and large suites of mainly non-succulent Karoo shrubs and with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats. The Koedoesberge-Moordenaars Karoo is described as a slightly undulating to hilly landscape covered by low succulent scrub and dotted by scattered tall shrubs, patches of ‘white’ grass visible on plains, the most conspicuous dominants being dwarf shrubs of *Pteronia*, *Drosanthemum* and *Galenia*. (Mucina & Rutherford, 2006).



**Figure 4 – One of the several windmills located on Wind Heuvel 1/190 facing west, S 32° 45' 11,7''; E 20° 19' 16,1''**



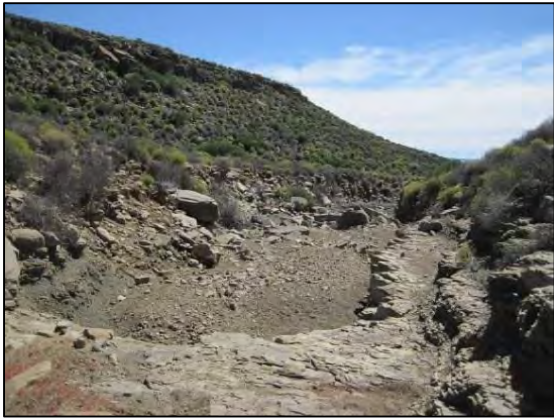
**Figure 5 – MET mast on Bloem Fontein RE/192 facing east, S 32° 45' 52,9''; E 20° 16' 54,9''**



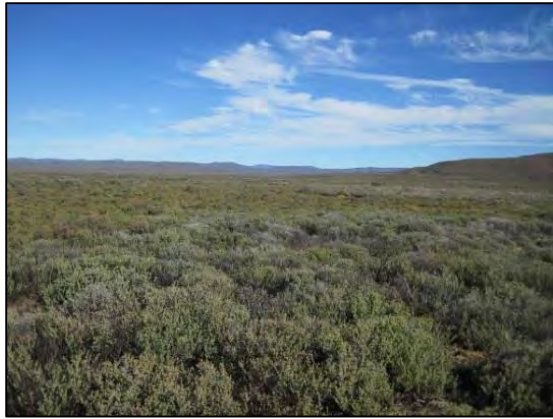
**Figure 6 – Fencing and tracks separating properties on Zeekoegat 169 facing east, S 32° 39' 56,9''; E 20° 20' 28,2''**



**Figure 7 – Characteristic ridge line, one of many that traverses the property on Hout Hoek RE/191 facing south, S 32° 42' 46,0''; E 20° 17' 25,2''**



**Figure 8 – Erosion gully on Hout Hoek RE/191 facing south-west, S 32° 44' 02,6''; E 20° 17' 26,1''**



**Figure 9 – Vastness of surrounding plains on Roodeheuvel 1/170 facing south, S 32° 40' 46,5''; E 20° 21' 08,4''**



**Figure 10 - Blossoming of the local vegetation on Hout Hoek RE/191 facing east, S 32° 44' 57,9''; E 20° 15' 00,2''**



**Figure 11 – Sparsely vegetated low-lying ridge (background), with general vegetation in foreground on Wind Heuvel RE/190 facing south, S 32° 44' 53,8''; E 20° 17' 54,5''**

## 3.2 Archival findings

The archival research focused on available information sources that were used to compile a background history of the study area and surrounds. This data then informed the possible heritage resources to be expected during field surveying.

### 3.2.1 South African Heritage Resources Information System (SAHRIS)

A scan of SAHRIS has revealed the following studies conducted in and around the study area of this report:

ALMOND, J, & ORTON, J. 2017. Heritage Impact Assessment: Proposed Construction of a Substation and 132 kV Distribution Line to support the Proposed Sutherland 2

WEF, Sutherland and Laingsburg Magisterial Districts, Northern and Western Cape. – **Historical and Stone Age heritage remains as well as several burial grounds and fossil sites were uncovered in this assessment. It was recommended that development may continue under the condition that 30m & 20m buffers are implemented around certain ‘no-go’ sites and that the relevant contingencies are implement should heritage remains be affected by the development process.**

BANDAMA, F. & MOHAPI, M. 2014. An Archaeological Scoping and Assessment Report for The Proposed Gamma (Victoria West, Northern Cape) - Kappa (Ceres – Western Cape) 765Kv (2) Eskom Power Transmission Line. - **This scoping report identified a range of heritage resources in and around the local area including: stone walling (kraals and possible windbreaks), ESA-LSA artefact scatters, buildings and farm complexes (with associated artefacts like glass, metal and ceramic), rock art and engravings, pottery and graves (both formal and informal).**

BOOTH, C. 2011. An archaeological desktop study for the proposed establishment of the Hidden Valley wind energy facility and associated infrastructure on a site south of Sutherland, Northern Cape Province. – **Desktop level assessment based of previous fieldwork done in the study area. A full Phase 1 AIA was recommended.**

BOOTH, C. 2012. A Phase 1 AIA for the proposed Hidden Valley Wind Energy Facility, near Sutherland, Northern cape Province. – **Historical heritage resources were uncovered in this assessment. It was recommended that an archaeologist be present during all construction related activities in two of the study areas.**

BOOTH, C. 2015. A Phase 1 Archaeological Impact Assessment for the Proposed Karusa Facility Substation and Ancillaries, near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, NC Province. - **No significant heritage resources were uncovered in this assessment. It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**

BOOTH, C. 2015. A Phase 1 Archaeological Impact Assessment for the Proposed Eskom Karusa Switching Station, Ancillaries and a 132kV Double Circuit Overhead Power Line, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province. – **Some low significance Historical heritage remains were uncovered in this assessment. It was recommended that a 30m buffer around discovered sites be adhered to and that the relevant**

**contingencies are implement should heritage remains be uncovered during the development process.**

BOOTH, C. 2015. A Phase 1 Archaeological Impact Assessment for the Proposed Soetwater Substation, 132kvV Overhead Powerline and Ancillaries Soetwater Wind Energy Facility, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province. - **No significant heritage resources were uncovered in this assessment. It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**

BOOTH, C. 2015. An Archaeological Walk-Through For The Proposed Karusa Wind Energy Facility Situated On The Farms: De Hoop 202, Standvastigheid 210, Portion 1 Of The Farm Rheeboeke Fontein 209, Portion 2 Of The Farm Rheeboeke Fontein 209, Portion 3 Of The Farm Rheeboeke Fontein 209 And The Remainder Of The Farm Rheeboeke Fontein 209, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province. – **Historical heritage resources were uncovered in this assessment. It was recommended that the historical remains be recorded and a destruction permit be applied for if they are not able to be avoided.**

BOOTH, C. 2015. An Archaeological Walk-Through For The Proposed Soetwater Wind Energy Facility Situated On The Farms: The Remainder Of And Portion 1, 2 And 4 Of Farm Orange Fontein 203 And Annex Orange Fontein 185, Farm Leeuwe Hoek 183 And Farm Zwanepoelshoek 184, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province. – **No significant heritage resources were uncovered in this assessment. It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**

BOOTH, C. 2015. Phase 1 Archaeological Impact Assessment for the proposed extension of the existing Komsberg Substation (two alternative areas) and widening of the access road, near Sutherland, NC Province. – **No heritage remains were uncovered in this assessment. It was recommended that the development may continue.**

BOOTH, C. 2017. An Archaeological Assessment for the Amendment to Turbine Specifications and the Revised Layout of the Karusa Wind Energy Facility Situated on the Farms De Hoop 202, Standvastigheid 210, Portion 1 of the Farm Rheeboeke Fontein 209, Portion 2 of the Farm Rheeboeke Fontein 209, Portion 3

of the Farm Rheeboeke Fontein 209 and the Remainder of the Farm Rheeboeke Fontein 209, Near Sutherland, Karoo Hoggland Local Municipality, Namakwa District Municipality, Northern Cape Province. - **No significant heritage resources were uncovered in this assessment. It was recommended that the development may continue and that the relevant contingencies are implemented should heritage remains be uncovered during the development process.**

FOURIE, W. 2010. Archaeological Walk Down Report: Gamma-Omega Transmission Section 1: Gamma-Kappa. - **This study identified a range of heritage resources, the majority of which comprise Stone Age artefact scatters of varying densities. These are primarily ESA and MSA scatters, although LSA artefacts were also located. In addition, rock engravings were also found, along with stone walled structures of varied construction (kraals, walls, possible wind breaks); infrequent non-decorated potsherds were sporadic. Later historical structures were also found (with glass, metal and ceramic fragments), along with associated graves/burial areas. The earliest graves place regional occupation pre-1892.**

FOURIE, W., ALMOND, J. & ORTON J. 2014. National Wind and Solar PV SEA Specialist Assessment Report – Heritage Evaluation. This report provides an overview of potential heritage impacts in the REDZ Komsberg focus area 2. - **The following types of heritage are listed for this area: Middle and Later Stone Age artefact scatters (frequently associated with water sources), rock art (confined to the mountainous areas), colonial farmsteads (18-19<sup>th</sup> Century – farmhouses, kraals and earth dams), provincial heritage sites (i.e., Matjiesfontein, Karooport), South African War period fortifications and cemeteries (dating back to the early 1800s).**

HALKETT, D, & ORTON, J. 2011. Heritage Impact Assessment for the Proposed Photovoltaic Solar Energy Facility on the Remainder of Farm Jakhalsvalley 99, Sutherland Magisterial District, Western Cape. – **Historical heritage resources were uncovered in this assessment. It was recommended that the development may continue however, the remains should be avoided and that the ECO must make sure of this.**

HALKETT, D. 2011. Heritage Impact Assessment Proposed Renewable Energy Facility at the Sutherland Site, Western and Northern Cape Provinces. – **Some historical and Stone Age heritage remains as well as a burial ground that was uncovered in this assessment. It was recommended that development may**

**continue and that the relevant contingencies are implement should heritage remains be affected by the development process.**

HALKETT, D. 2017. Heritage Impact Assessment: Proposed Construction of the 132Kv Powerline for the Maralla Wind Energy Facility near Sutherland Northern Cape. – **Historical, Iron Age and Stone Age heritage remains were uncovered in this desktop assessment. A targeted walk-down was recommended and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**

KAPLAN, J. 2009. Phase 1 Archaeological Impact Assessment of the Proposed Driefontein Resort (Driefontein Farm No. 127) Sutherland, Northern Cape Province. **Historical heritage remains were uncovered in this assessment. It was recommended that the historical remains be avoided and that a Conservation Management Plan be drafted to protect the remains.**

KAPLAN, J. 2015. Proposed borrow pit (Karusa East) on the Farm Rheeboeke Fontein 209/2 & 209/3 near Sutherland, Northern Cape. – **Low significance historical heritage resources were uncovered in this assessment. It was recommended that the development may continue and that the relevant heritage authorities should be contacted if any human remains are uncovered during the development process.**

KAPLAN, J. 2015. Proposed borrow pit (Karusa North) on the Farm Rheeboeke Fontein 209 Remainder near Sutherland, Northern Cape Assessment conducted under Section 38 (3) of the National Heritage Resource Act (No. 25 of 1999). – **Historical, Iron Age and Stone Age heritage remains were uncovered in this assessment. Relevant sites should be protected, 20m buffers implemented where necessary and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**

KAPLAN, J. 2015. Proposed quarry on the farm Jakhals Valley 99 Portion 3 near Sutherland, Northern Cape. - **No significant heritage resources were uncovered in this assessment. It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**

MURIMBIKA, M. 2014. Executive Summary For Phase 1 Heritage Impact Assessment Study Report: Proposed Gamma-Kappa 2nd 765kV Eskom Transmission Powerline and Substations Upgrade Development in Western Cape. - **This report summarises a range of heritage resources in and around the local area including: stone walling (kraals and possible windbreaks), ESA-LSA artefact scatters, buildings and farm complexes (with associated artefacts like glass,**

**metal and ceramic), rock art and engravings, pottery and graves (both formal and informal).**

ROUSSOUW, L. 2007. Phase 1 Archaeological Impact Assessment and Palaeontological Impact Assessment of 30 Gravel Quarries in the R354 Between Calvinia and Sutherland, Northern Cape Province – **No heritage remains were uncovered.**

SMITH, A.B. 2008. Eskom Gamma-Omega 765kV Transmission Line: Archaeological Desktop Survey. - **This study, focusing on an area defined as the Karoo, identified five farms near to the current study area that contain Stone Age (ESA, MSA and LSA) artefacts, pottery and rock paintings.**

VAN DER RYST, M. & FOURIE, W. 2014. Phase 2 Specialist Study of Affected Stone Age Locality on The Gamma Kappa Transmission Line – Tower GKB-T846 (Site GK062), Tankwa Karoo, Touwsrivier. - **This report documents medium density scatters of ESA, MSA and LSA artefacts at a single deflated, secondary context, locality, with the assemblage comprising a very low quantity of formal tools.**

VAN DER WALT, J. 2015. Archaeological Impact Assessment Report for the Proposed Gunstfontein Wind Energy Facility, Northern Cape. - **Historical remains as well as Rock Art was uncovered in this assessment. It was recommended that the development footprint be updated in order to accommodate the heritage findings and that the ECO must make sure the heritage resources are protected.**

VAN DER WALT, J. 2016. Archaeological impact assessment report for the proposed Gunstfontein 132 kV power line, switching station and ancillaries for the proposed Gunstfontein wind energy facility near Sutherland, Northern Cape. – **Desktop level assessment based of previous fieldwork done in the study area. Historical remains as well as Rock Art was uncovered in this assessment. It is recommended that a full heritage walk down of the of study area must be conducted.**

WEBLEY, L. 2017. Heritage Impact Assessment: Proposed Construction of the Maralla West Wind Energy Facility near Sutherland in the Northern Cape. – **Historical and Stone Age heritage remains were uncovered in this assessment. It was recommended that highly sensitive No-Go area should be avoided, that a walk-down be conducted should the development layout change and that the relevant contingencies are implement should heritage remains be uncovered during the development process.**



### 3.3 Archaeological background

#### 3.3.1 Early Stone Age (400 000 – 3.3 million years Before Present/BP)

The earliest artefacts from the ESA are produced during the Oldowan. Although the Lomekwian is an earlier industry, found elsewhere in Africa dating to ~3.3 million years ago, it, as well as the Oldowan, is not relevant as it does not occur in these parts of southern Africa. Following the Oldowan is the Acheulean, beginning at around ~1.5 million years ago. This technology is characterised by the presence of Large Cutting Tools (LCTs), in the form of handaxes, cleavers and occasional picks. These are tools that can either be unifacial, partly bifacial or bifacial, and they are important tools that would have been used to perform a range of subsistence-based activities during the Acheulean. In addition to these artefacts, flakes occur that show deliberate shaping (retouch) to create smaller formal tools (e.g., scrapers). A range of cores also occurs, and elsewhere during this period we see the earliest representations of systematic core reduction in the Victoria West Industry, the earliest form of Prepared Core Technology (Li *et al.* 2017). This type of reduction illustrates that stone cores were reduced in ways to attain predetermined flake blanks of specific shapes and sizes. In addition, this core reduction prolongs the usability of the core as core convexities are continually maintained throughout the process of flake removal.

One of the best sites with examples of this phase have been found at Wonderwerk Cave in the Northern Cape (Berna *et al.* 2012). This site is of particular importance because its excavations have provided some of the first evidence of the controlled use of fire by hominins dating to approximately 1 million years ago (Berna *et al.* 2012). Other archaeological sites associated with the Earlier Stone Age from the Northern Cape, is Canteen Kopje, Kathu Pan and Roodam which has yielded many invaluable artefacts primarily associated with the Acheulian, this particular period of Earlier Stone Age (Herries, 2011).

Overall, the presence of ESA artefacts in the study area is low, given the vast amounts of land that have been surveyed in previous reports. Other reports from the area have confirmed that where artefact scatters do occur, they are frequently associated with water resources (or areas where it once occurred, i.e., dry pans and riverbeds). These artefact scatters are also rarely associated with organic remains (Bandama 2017), and their contexts are poor given that they have been exposed at the surface for vast periods of time.

### 3.3.2 Middle Stone Age (30 000 – 300 000 BP)

The MSA is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the Prepared Core Technique. This phase of stone tool development is associated with modern humans and complex cognition.

Within the Northern Cape examples of such artefacts have been found at the Bundu Farm, Kathu Pan and Wonderwerk Cave sites (Lombard et al. 2012). It is also widely argued that this time period saw the advent of "modern human behaviour".

Based on the pre-existing data obtained from heritage surveys in the area, the vast majority of MSA material is generally found at the surface and in deflated contexts. As a result, the overall significance and value of these assemblages is somewhat reduced, given that their original associations have been modified (or in most cases completely removed).

### 3.3.3 Later Stone Age (30 000 BP – recent times)

The Later Stone Age (LSA) is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths. A vast array of LSA sites from a range of different periods is known for the Northern Cape.

A detailed summary of these is provided by Lombard *et al.* (2012). Early LSA sites are characterised by unstandardized assemblages but given that some of these sites have contextual issues perhaps this can be expected, given that these types of LSA sites are often regarded as being transitional MSA-LSA sites, with a mix of technologies. Robberg LSA sites show systematic blade production, along with high quantities of bladelets and bladelet cores, few formal tools and macroliths (at certain sites). Oakhurst LSA sites show technological trends for these sites include a general absence of microliths, a range of scrapers and adzes, and bone tools. Wilton LSA sites are characterised by numerous microlithic formal tools, showing systematic production of backed artefacts and small convex scrapers; additional cultural items like ostrich eggshell (OES), ochre and bone, shell and wooden artefacts are also common.

There is significant technological variability in the late LSA assemblages, and there are both microlithic and macrolithic components. Scrapers, blades, bladelets, backed tools and adzes do not occur at all of these sites, and informal untrimmed large flakes and macrolithic pieces are characteristic of Smithfield assemblages. As with the Wilton LSA sites, OES, bone and ochre is common, and iron objects start to appear. The final phase of the LSA is termed the ceramic final LSA, and this is reserved for those assemblages that contain ceramics (pottery), which is thin walled and contains grit or grass temper. The stone artefacts in these late assemblages are variable and can include microliths, grind and ground stone pieces, variable quantities of formal tools, ochre, OES, metal objects, beads and glass.

A large number of Later Stone Age sites are known in the Northern Cape Province. Some of these include those sites found in the Seacow Valley (Sampson, 1988) and Little Witkrans, Powerhouse Cave, and Blinkklipkop (Humphreys & Thackeray, 1983). And the more famous sites such as Wonderwerk Cave in Kuruman and Canteen Kopje in Barkley West, near Kimberley (Forssman et al. 2010).

Canteen Kopje exhibits evidence of a very rich cultural history in the later periods of the Later Stone Age where the hunter-gatherers would interact with Khoekhoe herders that moved into the region, which we can tell from excavated domesticated animal remains such as sheep and goats (Forssman et al. 2010). These communities even entered a network of cultural exchange within the last 2000 years. Similar evidence has also been recovered from Wonderwerk Cave (Forssman et al. 2010).

Elsewhere, surrounding the study area, numerous heritage reports have identified numerous LSA lithic scatters. Importantly, these have also identified the coexistence of LSA sites with both stone walling and pottery. This would suggest later phases of the LSA occur in this region, evidenced by the co-occurrence of these artefacts/structures that suggests a mixed economy. Stone walling in this part of South Africa dates to the Stone Age (Sadr 2012).

#### 3.3.4 *Rock Art*

By the beginning of the Later Stone Age, human behaviours were undoubtedly modern (Huffman 2005). Uniquely human traits, such as rock art and purposeful burials with ornaments, became regular practice (Huffman 2005). These people were most likely the ancestors of the San, who are well known their fine-lined rock art and rock engravings.

Bushman rock paintings are well known in the Koue Bokkeveld and adjacent regions (Johnson et al 1959; Yates et al 1993). The paintings at Stompiesfontein and Bloubosfontein depict colonial imagery that include a woman in colonial dress, men with guns and on horses, coaches and wagons with mules, horses and oxen (Johnson et al 1959). Karooport is also known for the occurrence of rock painting (PGS 2010).

### 3.3.5 *Iron Age Sequence*

Despite the widespread occurrence of the Iron Age sequence across the northern portions of South Africa, Iron Age remains south of the Orange River moving into the Northern Cape, is noticeably sparse (Humphreys 1976; Humphreys 1988). Humphreys (1977) suggests that the absence of Iron Age occupation in this part of the country is largely due to the falloff of higher rainfall isohyets in the farther south-west portion of the country. Considering that Iron Age peoples were farmers, they were greatly influenced by climatic factors and were most likely deterred by the arid conditions of the Cape (Humphreys 1977). Another possibility for their absence in the archaeological record could simply be attributed to the lack of Iron Age research conducted in this part of South Africa (Humphreys 1977).

### 3.3.6 *Type R Settlements*

Humphreys (1988) claims that the stone wall settlements found on the southernmost frontier of the southern African Iron Age occupation, having been termed the Type R Settlements, were inhabited by peoples with a hunter-gatherer/herder economy. He argues that through interactions with Iron Age farmers to the north, these people picked up on Iron Age traditions such as ceramic production (that was half-way between Later Stone Age and Iron Age ceramic traditions), sheep and cattle herding as well as stone wall settlement construction (Humphreys 1988).

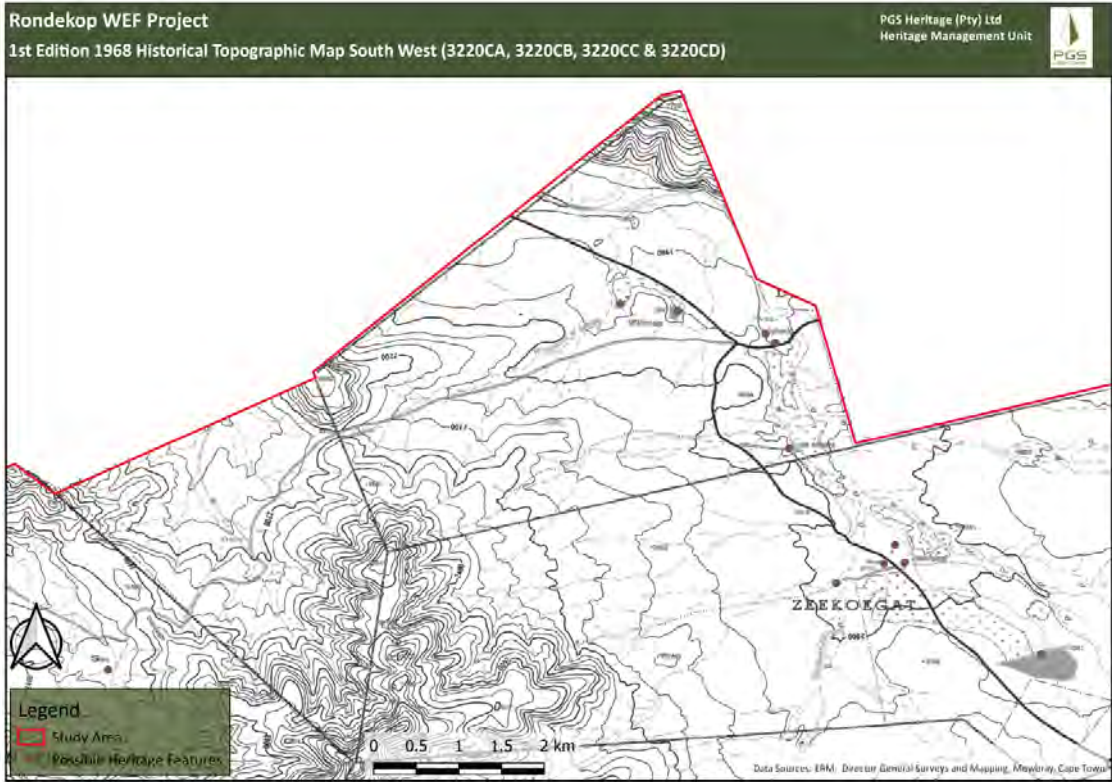
These occurrences tie in with what was known as the *Little Ice Age*, a fluctuation in global climate between 800 to 600 years ago, which may have caused a more hospitable environment for the grazing of cattle and therefore the occupation of Khoekhoen pastoralists in the region (Bandama 2017). From the archaeological evidence of 'lobed' stone walling combined with historical artefactual remains, it is known that Sotho and Xhosa speakers had also entered the region, living alongside Khoisan settlers moving into the historical period, all of whom having had interactions with colonial settlers (Bandama 2017).

### 3.4 Archival/historical maps

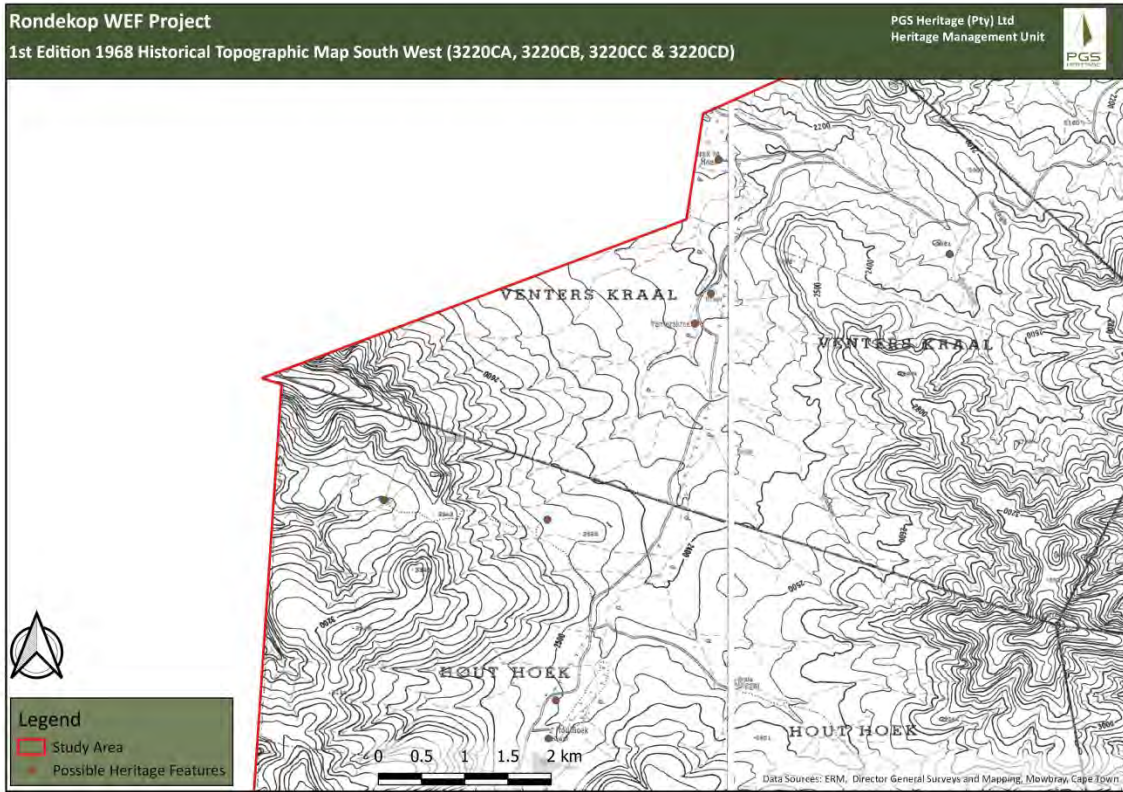
Historical topographic maps were available for cultural resources analysis in the study are:

- **Topographical map 3220CA** – First edition 1967. The aerial photography on which the map was based dates to 1960 and its survey work was undertaken in 1967. It was drawn in 1968 by the Trigonometrical Survey Office. The aerial photography on which the map was based dates to 1960 and its survey work was undertaken in 1967. It was drawn in 1968 by the Trigonometrical Survey Office.
- **Topographical map 3220CB** – First edition 1967. The aerial photography on which the map was based dates to 1960 and its survey work was undertaken in 1967. It was drawn in 1968 by the Trigonometrical Survey Office.
- **Topographical map 3220CC** – First edition 1968. The aerial photography on which the map was based dates to 1963 and its survey work was undertaken in 1968. It was drawn in 1969 by the Trigonometrical Survey Office
- **Topographical map 3220CD** – First edition 1968. The aerial photography on which the map was based dates to 1963 and its survey work was undertaken in 1968. It was drawn in 1969 by the Trigonometrical Survey Office.

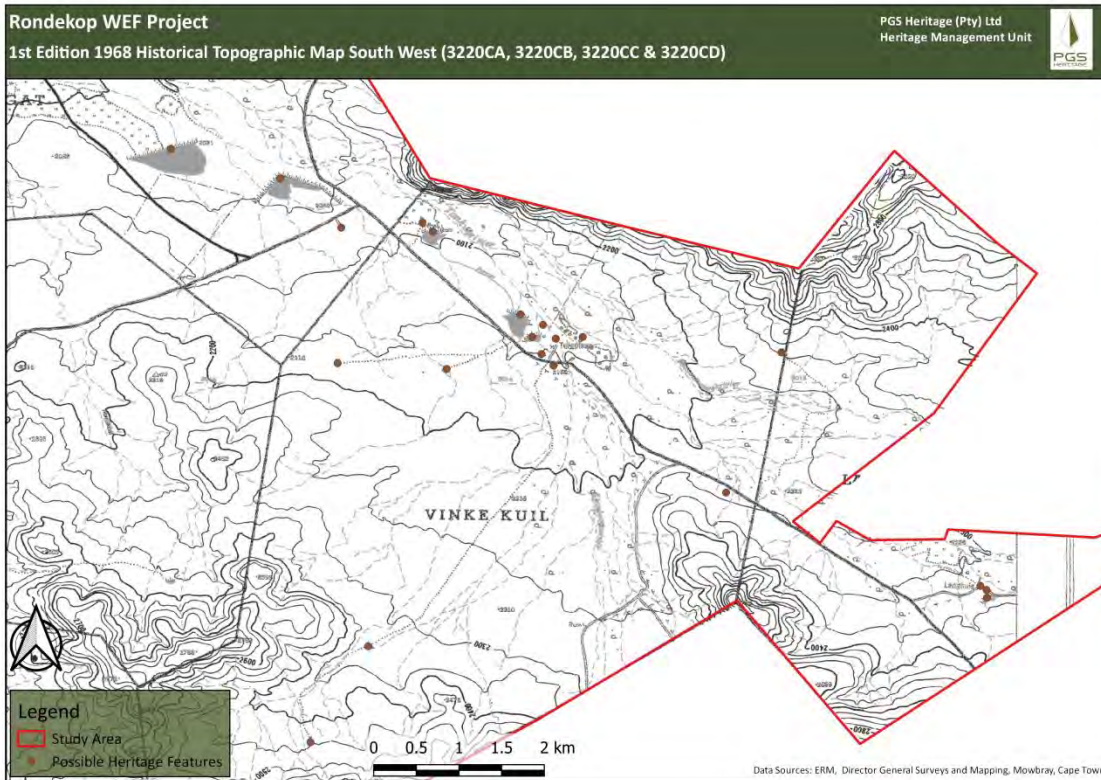
These maps were utilised to identify structures that could possibly be older than 60 years and thus protected under Section 34 and 35 of the NHRA. One can see many structures spanning the greater study area. Most of which seem to be old dams and windmills, while there are multiple representations of kraals farm houses belonging to the various farms that the application area spans (**Figure 12, Figure 13, Figure 14, Figure 15 & Figure 16**).



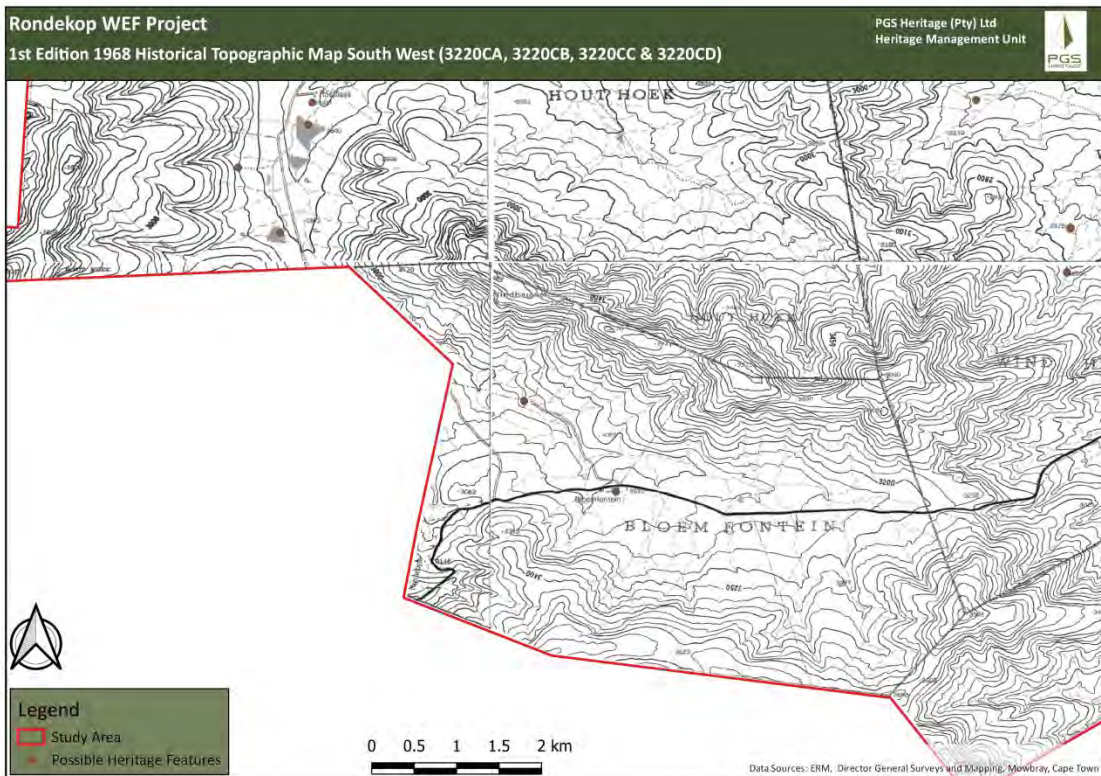
**Figure 12 – 1<sup>st</sup> Edition 1968 Historical Topographic Map (3220CA, 3220CB, 3220CC & 3220CD), potential heritage features include old windmills, dams, original farm structures and kraals**



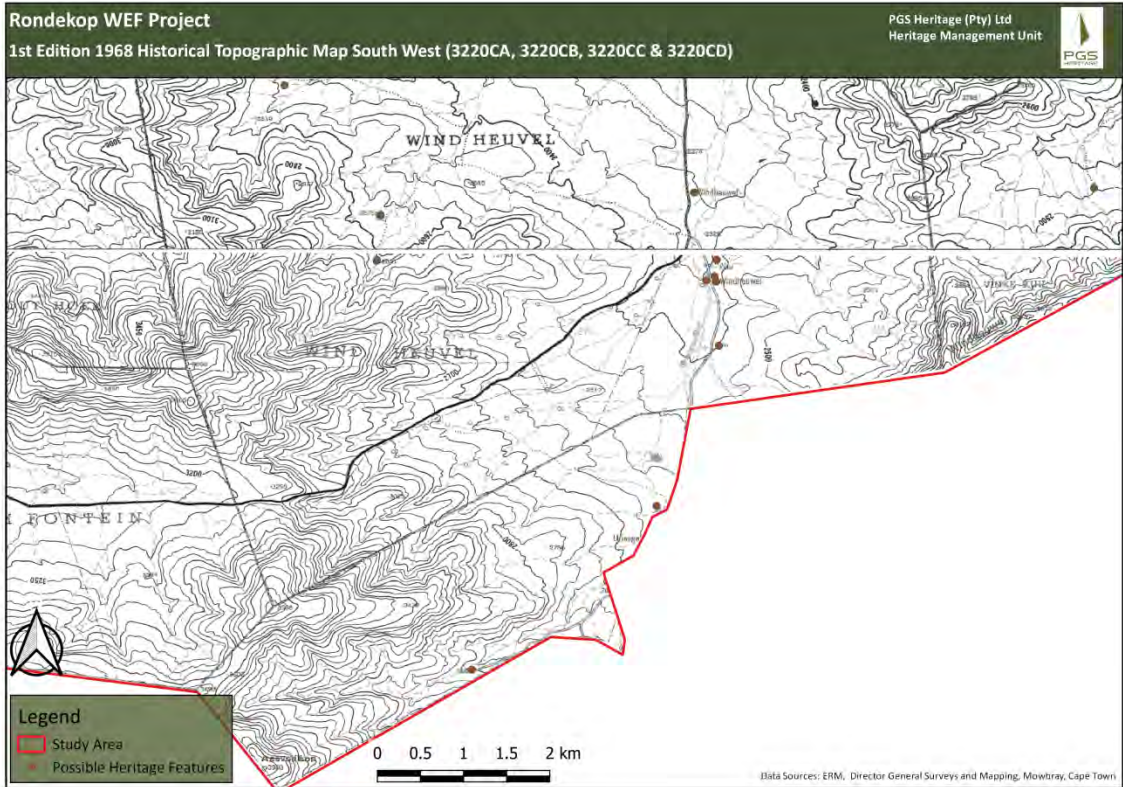
**Figure 13 - 1<sup>st</sup> Edition 1968 Historical Topographic Map (3220CA, 3220CB, 3220CC & 3220CD), potential heritage features include old windmills, dams, original farm structures and kraals**



**Figure 14 - 1st Edition 1968 Historical Topographic Map (3220CA, 3220CB, 3220CC & 3220CD), potential heritage features include old windmills, dams, original farm structures and kraals**



**Figure 15 - 1st Edition 1968 Historical Topographic Map (3220CA, 3220CB, 3220CC & 3220CD), potential heritage features include old windmills, dams, original farm structures and kraals**



**Figure 16 - 1st Edition 1968 Historical Topographic Map (3220CA, 3220CB, 3220CC & 3220CD), potential heritage features include old windmills, dams, original farm structures and kraals**

**3.5 Aspects of the area’s history as revealed by the archival/desktop study**

*3.5.1 Early Settlement during the Late Iron Age and Historic Period*

During the late 1700s, the interactions had intensified between the previously mentioned cultural groups during the later LSA period (Bandama 2017). Major conflict occurred the region between the pastoral groups and the local San people up until the 1880s, who raided the livestock of the pastoral groups in a form of resistance to colonial expansion in the Karoo (Bandama 2017). Some Khoekhoen groups even assisted the Trekboers in the extermination of San groups of the Roggevel and Great Escarpment (Bandama 2017). As a direct result of all these interactions and conflicts between so many different groups during this period, the archaeological signatures of the groups who assisted the Trekboers included various European goods and weapons (Bandama 2017).

The Bantu-speaking (Xhosa) communities had appeared in this part of the Karoo in the late 1700s to take part in the ivory trade and subsequently facilitate their interactions with the local Trekboers and San (Bandama 2017). Although mostly occurring near Victoria West (from 1809) and on the borders of Beaufort West (1830), these communities also



built stone walled structures similar to those made by the Khoisan groups however, the of archaeological evidence of their occupations may be to lack of research on this type of archaeology (Bandama 2017). At around the same time, possibly due to migrating refugees incurred by the *Mfecane*, Sotho-speaking communities had begun inhabiting parts of the Karoo, also constructing similar stone structures to those used by the Khoesan and Xhosa (Bandama 2017). During the colonial period, whether by choice or not, Sotho masons would construct kraals and cottages for the Trekboers and such structures became a prominent feature of the 19<sup>th</sup> century historical period in the Karoo (Bandama 2017).

#### **4 FIELDWORK AND FINDINGS**

Due to the nature of cultural remains, a systematic controlled-exclusive surface survey was conducted on foot and in a vehicle, over a period of five days by one archaeologist and field technician from PGS. The heritage fieldwork was conducted on the 20<sup>th</sup>-24<sup>th</sup> September while the palaeontological fieldwork was conducted from the 1<sup>st</sup> – 3<sup>rd</sup> October. The track logs (in orange) for the heritage survey are indicated in **Figure 17**. The locations of the heritage sites uncovered during the fieldwork component are illustrated in **Figure 18**; five (5) heritage sites were located within the study area, where the focus was placed on the proposed development foot print areas due to the extent of the application area. They are described below in **Table 1**. The various potential sites uncovered during the archival desktop research, were confirmed to not be of heritage value.

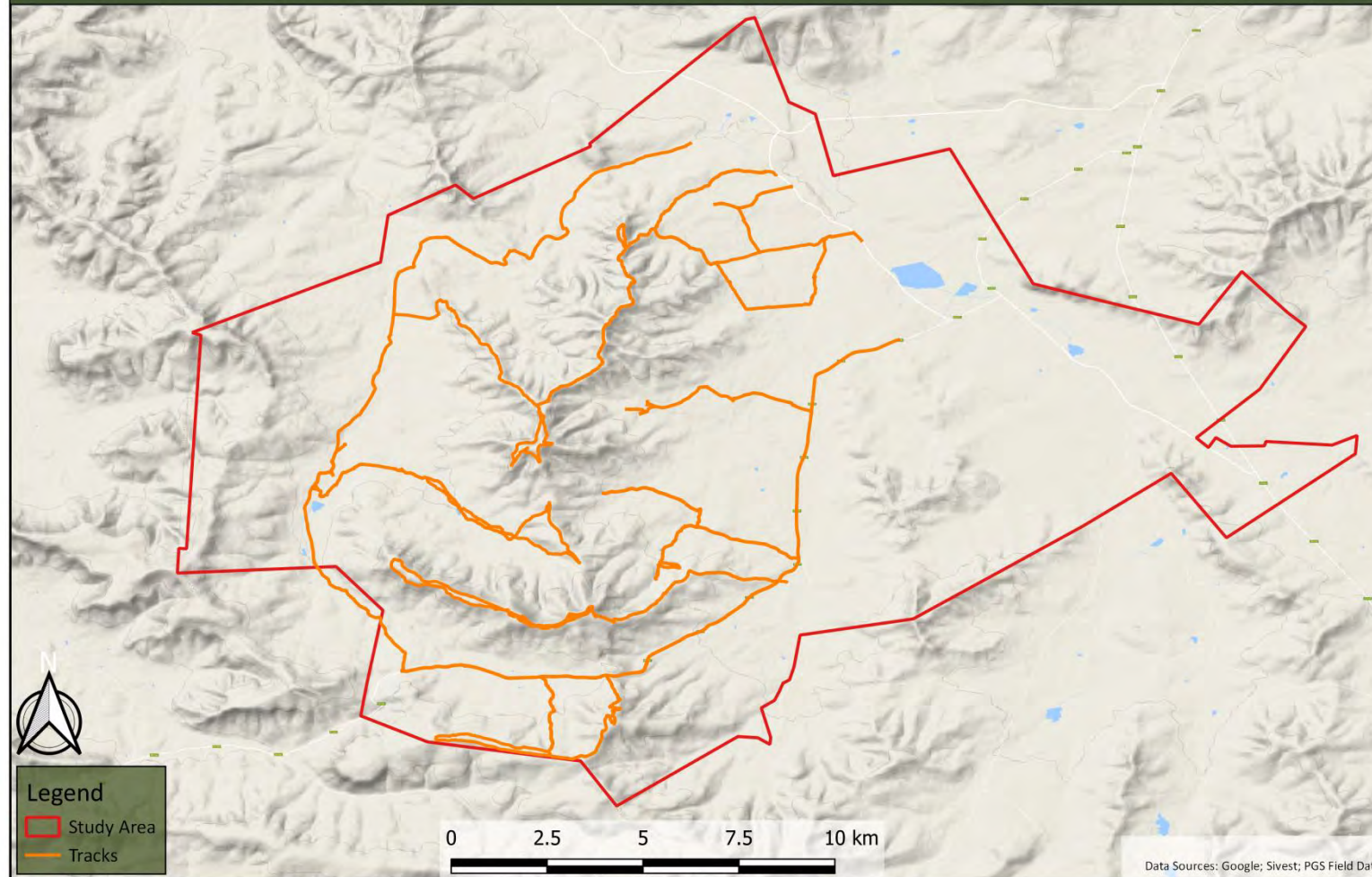


Figure 17 – Track log recordings from site visit (20<sup>th</sup>-24<sup>th</sup> September 2018)

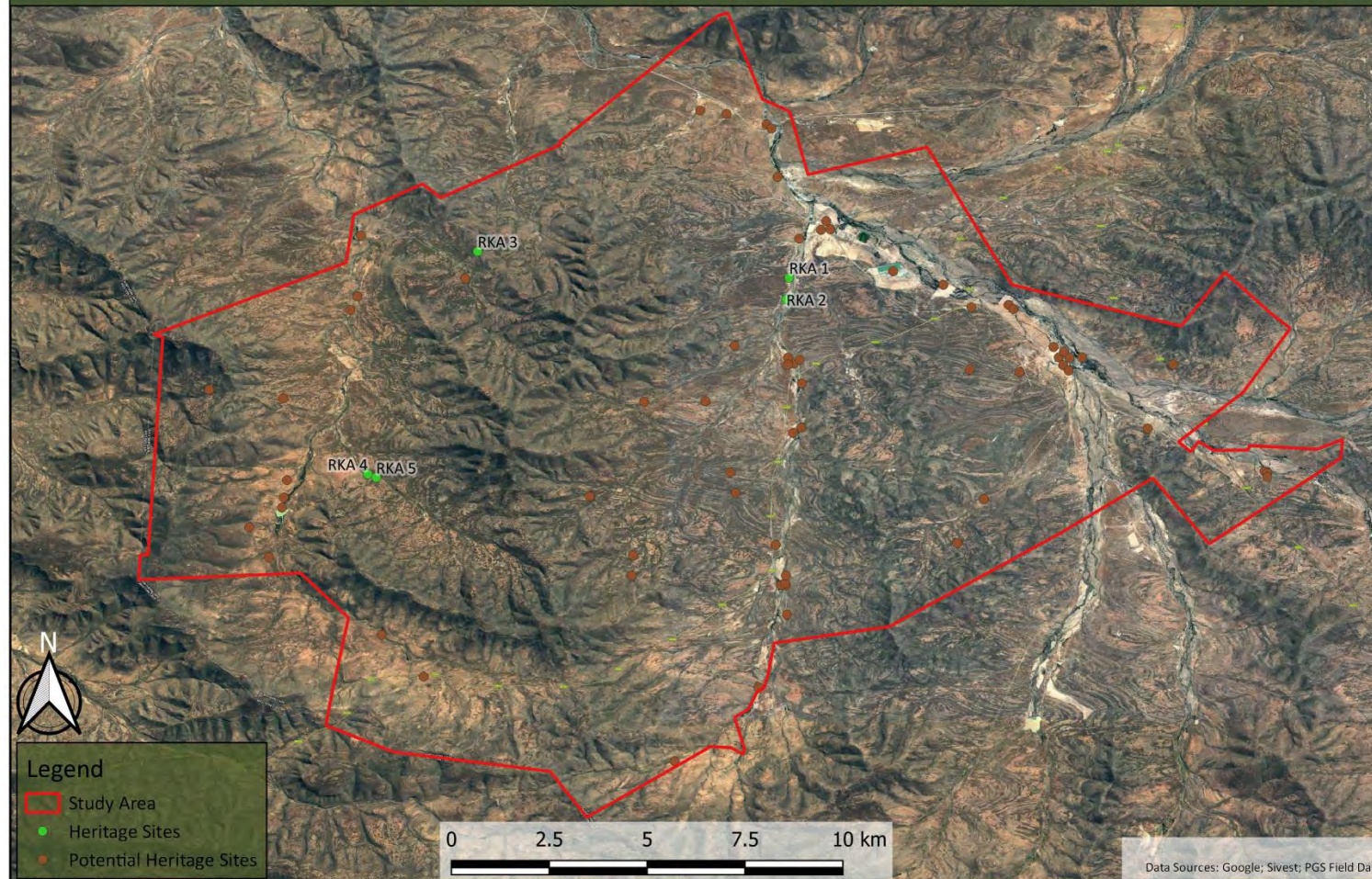
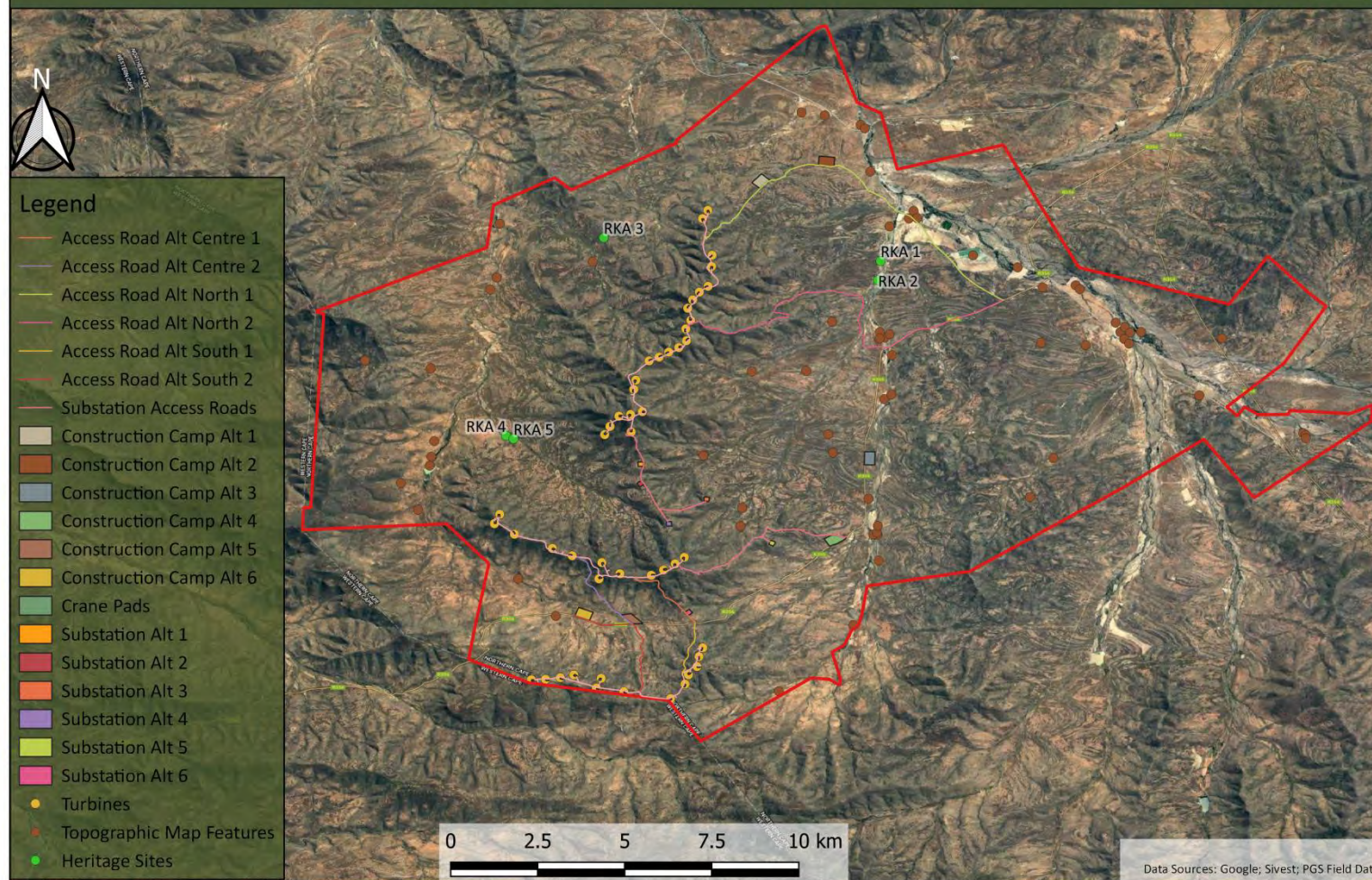


Figure 18 – Heritage site locations identified during field survey within and around study area, including potential heritage sites as indicated on the historical topographic maps

**Rondekop Windfarm Project**  
**Development Layout of Rondekop WEF**

PGS Heritage (Pty) Ltd  
 Heritage Management Unit



**Figure 19 - Proposed Rondekop WEF Development area as well as associated infrastructure alternatives.**

**CLIENT NAME:** G7 Renewables (PTY) LTD  
**Project Description:** Rondekop WEF

**prepared by:** PGS for SIVEST

**Revision No. 0**  
 14 December 2018

#### 4.1 Archaeological and historical resources

Table 1 – List of field survey heritage finds

Site <sup>1</sup> number	Lat	Lon	Description	Heritage Significance	Heritage Rating
RKA01	S32.67025°	E20.36509°	This find spot <sup>2</sup> comprises two MSA flakes that were found in a deflated area. <b>Site extent:</b> 1x1m.	Low	GP.C



Figure 20 – View of area exposed by sheet erosion at RKA01



Figure 21 – Ventral view, with clear bulbs of percussion of MSA flakes

<sup>1</sup> Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

<sup>2</sup> Classified as an area where archaeological material isolated but in such low concentrations that it cannot be classified as an archaeological site as per the definition in this report

Site <sup>3</sup> number	Lat	Lon	Description	Heritage Significance	Heritage Rating
RKA02	S32.67615°	E20.36433°	This site comprises a low-density scatter (2-5 artefacts/10m <sup>2</sup> ) of LSA artefacts that were identified in an open, deflated area. The artefacts were identified in a clearing which is subject to sheet erosion. The artefacts include cores, a scraper, flakes, chips and chunks which were produced from fine- grained dolorite, quarts and CCS (Crypto-crystalline silicates). <b>Site extent:</b> 20x20m.	Low	GP.C



Figure 22 – General view of RKA02



Figure 23 – Cores, scraper, flakes, chips produced from fine-grained dolorite, quarts, and CCS uncovered at RKA02

<sup>3</sup> Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

Site <sup>3</sup> number	Lat	Lon	Description	Heritage Significance	Heritage Rating
RKA03	S32.66310°	E20.28010°	This site comprises a memorial for D.A.C. Esterhuysen. It is situated next to one of the farm roads, constructed out of stone and cement and has a height of approximately 1m. An inscribed marble plaque was placed at the top end of the memorial reading: "D.A.C. Esterhuysen, 30 – 04 – 1919, 03 – 09 – 1981". <b>Site extent:</b> 1x1m.	Medium	GP.B



Figure 24 – View of memorial constructed out of stone and cement



Figure 25 - Marble plaque reading: "D.A.C. Esterhuysen, 30 – 04 – 1919, 03 – 09 – 1981"

Site <sup>3</sup> number	Lat	Lon	Description	Heritage Significance	Heritage Rating
RKA04	S32.72384°	E20.25011°	<p>This site comprises the remains of a stone-built house and attached dry stone walled kraal. The rectangular shaped house has two rooms with doors on the northern side and a window with a wooden window frame on the eastern side. The roof of the structure was removed, but some of the wooden rafters are still in place. Two rectangular shaped kraals were attached to the back of the house on the southern side. The walls of the kraals are approximately 1 meter high and they are connected to each other through a small gate in the middle between them. The second kraal has a stone and cement-built dipping well.</p> <p>The site is marked on the 1967 map with the name “Dipgat” and changed to “Diepgat” on the 1983 topomap.</p> <p><b>Site extent:</b> 5x5m.</p>	Medium	GP.B



Figure 26 – Small stone house and attached cattle kraal at RKA04



Figure 27 – Stone and cement dipping well



Site <sup>3</sup> number	Lat	Lon	Description	Heritage Significance	Heritage Rating
RKA05	S32.72478°	E20.25241°	This site comprises a low-density scatter (2-5 artefacts/10m <sup>2</sup> ) of Later Stone Age artefacts that was situated in a clearing, subject to some measure of sheet erosion exposing them, approximately 50m from a dry river bed and also approximately 50m from the building identified at site RKA 004. The artefacts consist mostly of debitage (waste material such as flakes, chips and chunks) which were produced from fine-grained dolerite, quartz and CCS (Crypto-crystalline silicates). <b>Site extent:</b> 15x15m.	Low	GP.C



Figure 28 – General landscape at site RKA05



Figure 29 – Dolerite, quartz and CCS debitage

Rondekop Windfarm Project  
Heritage Sensitivity Ratings

PGS Heritage (Pty) Ltd  
Heritage Management Unit

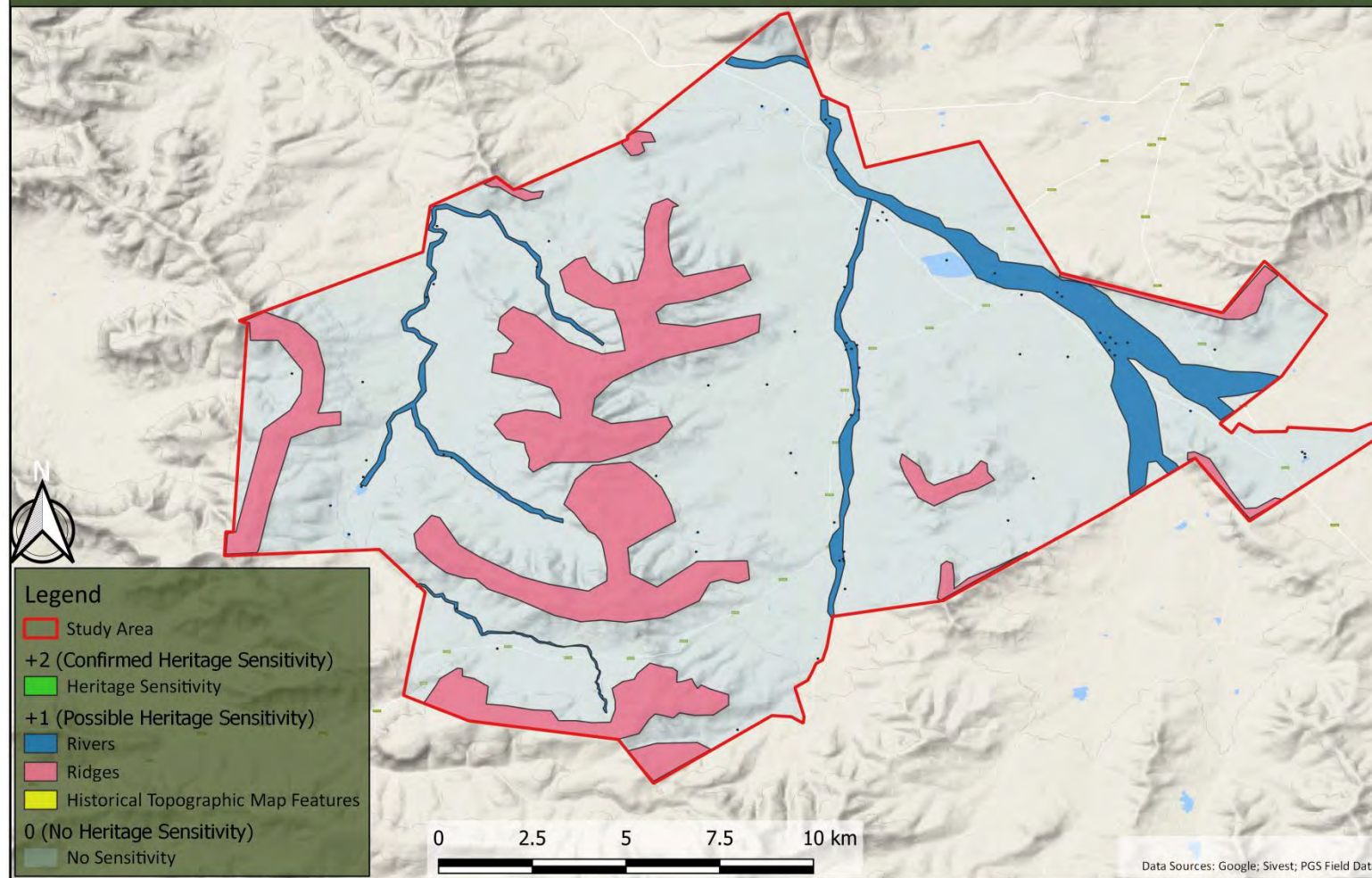


Figure 30 – Sensitivity rating map

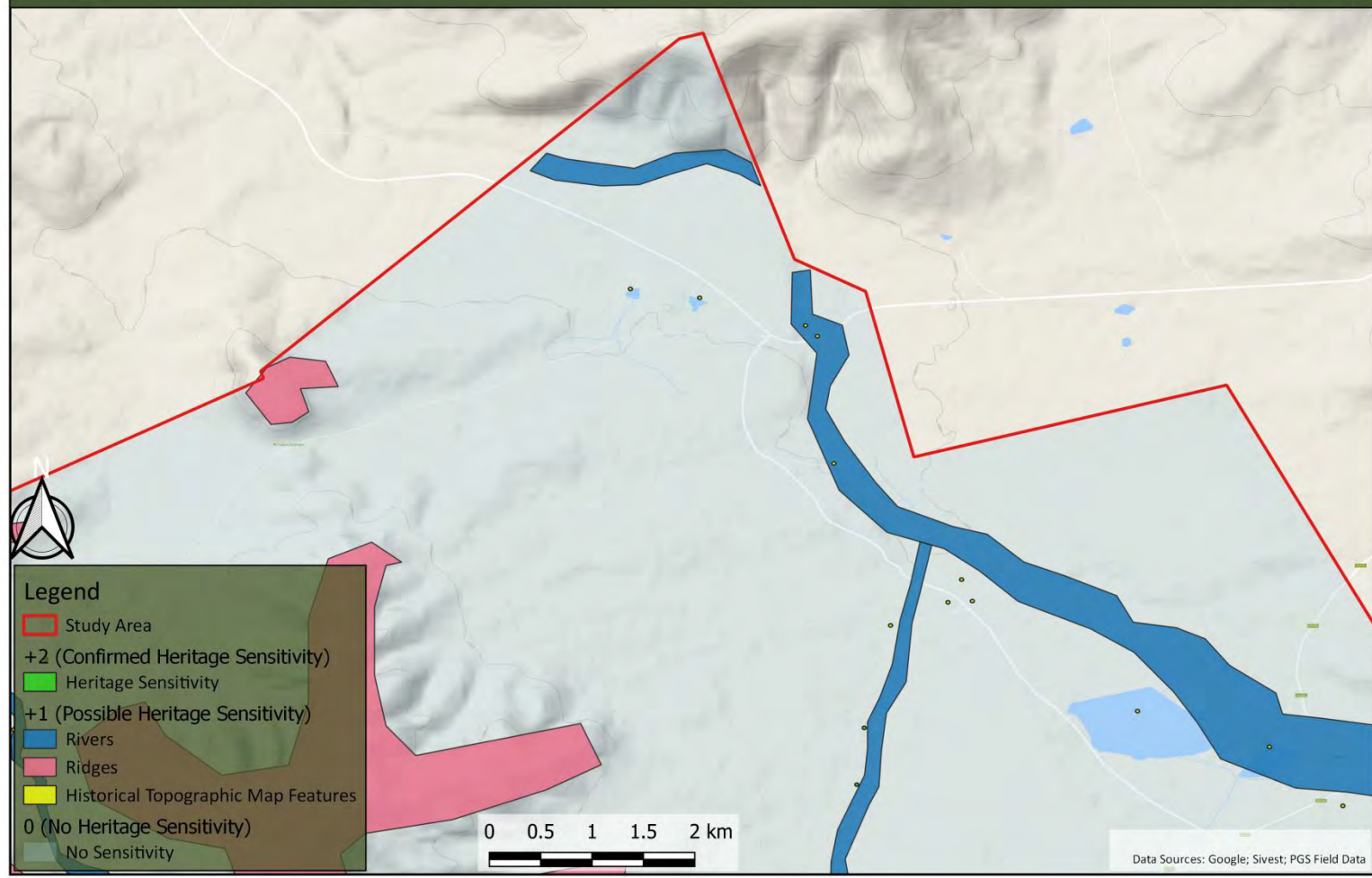


Figure 31 - Sensitivity rating map, Northern section



Figure 32 - Sensitivity rating map, North-Mid section

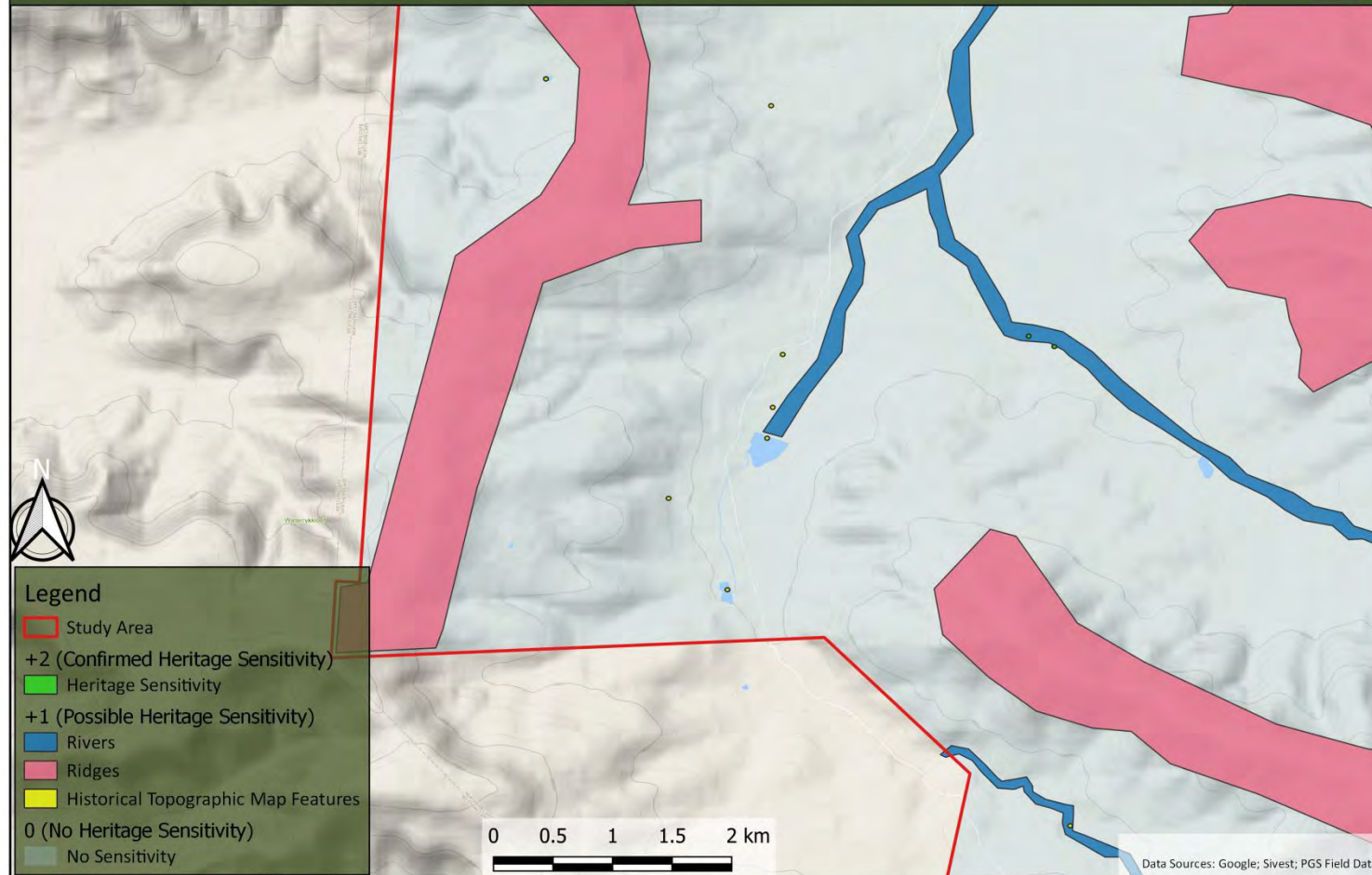


Figure 33 - Sensitivity rating map, South-West section

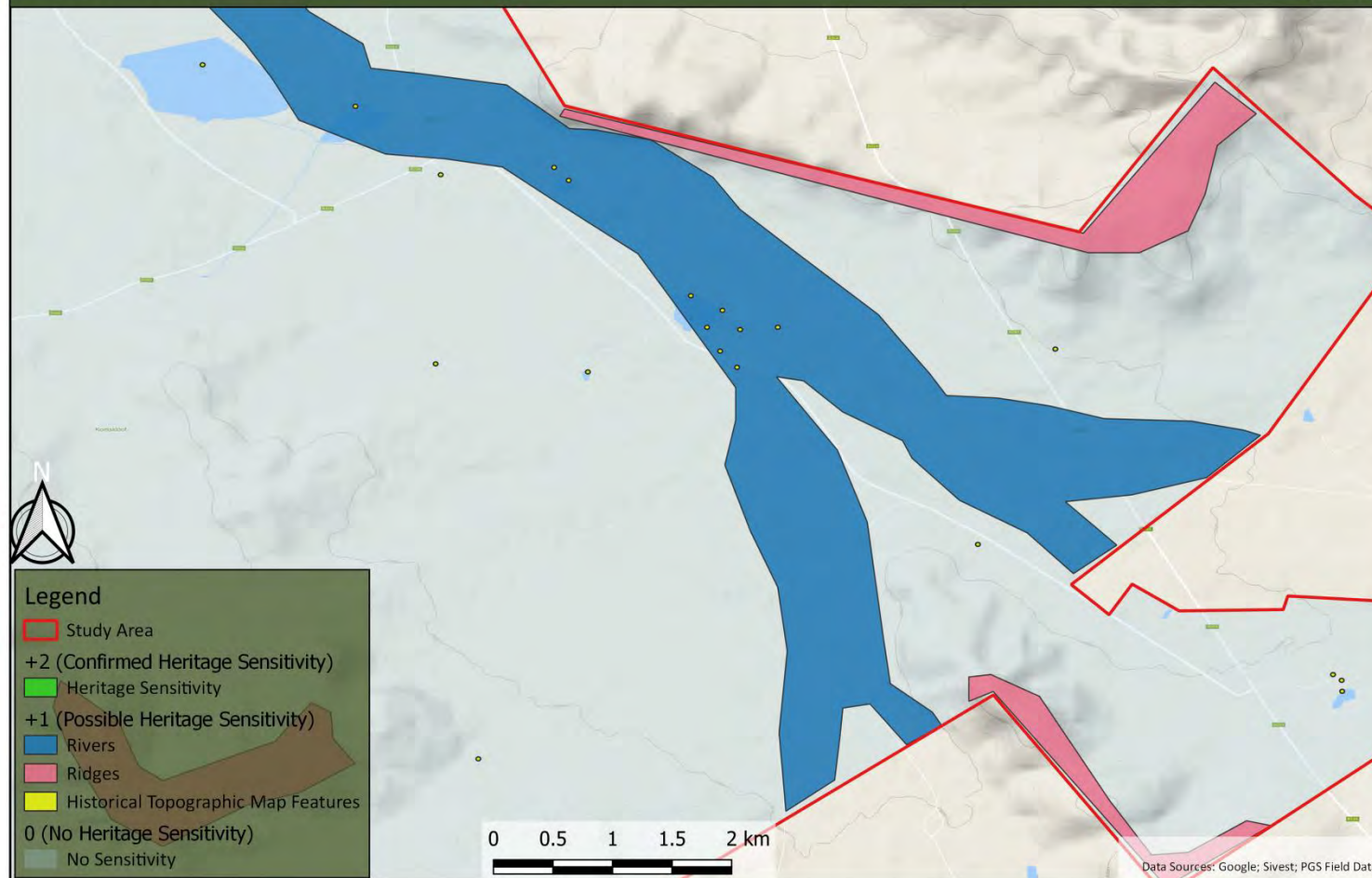


Figure 34 - Sensitivity rating map, East section

Rondekop Windfarm Project  
Heritage Sensitivity Ratings

PGS Heritage (Pty) Ltd  
Heritage Management Unit

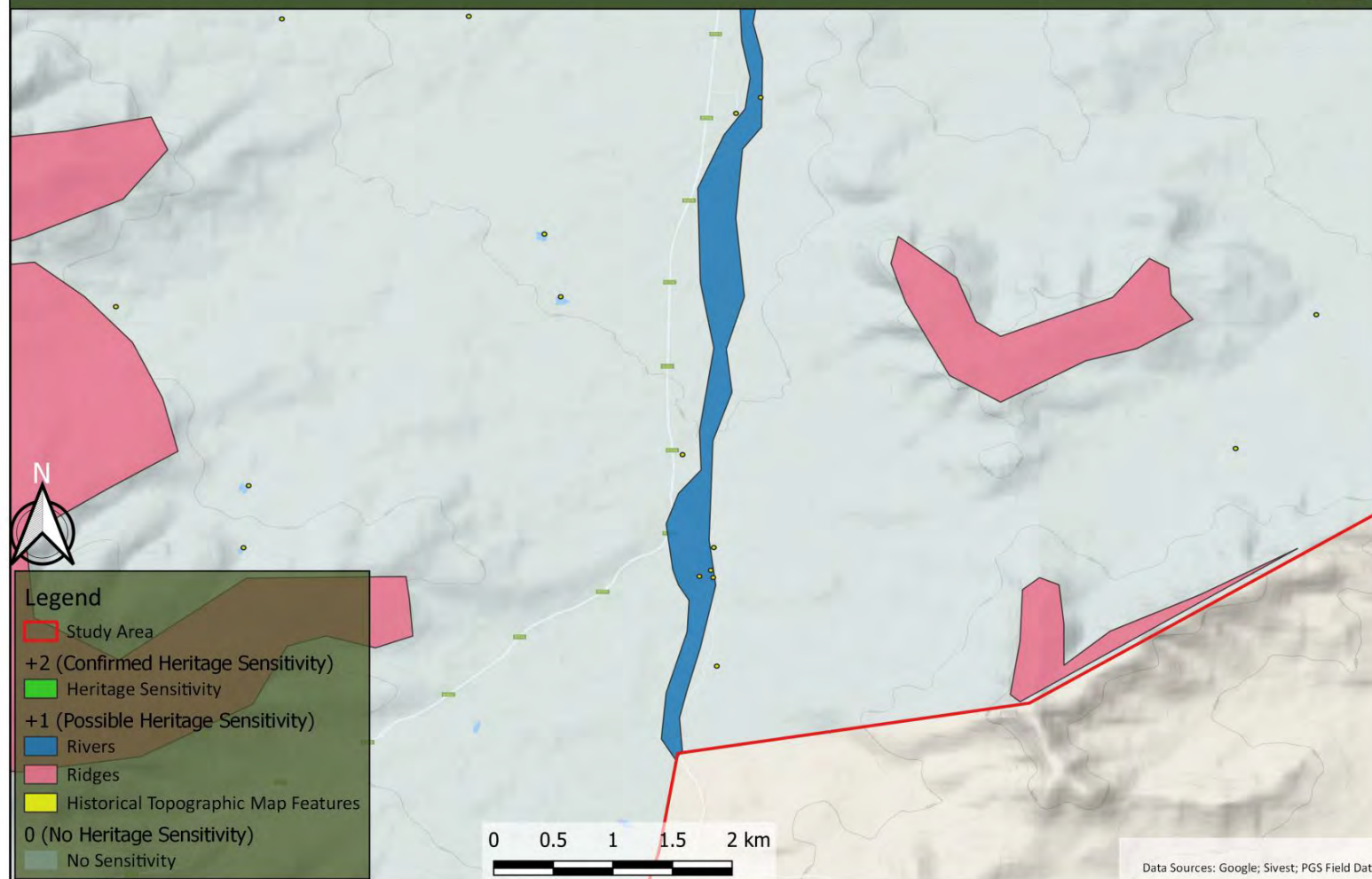


Figure 35 - Sensitivity rating map, South-East section

CLIENT NAME: G7 Renewables (PTY) LTD  
Project Description: Rondekop WEF

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prepared by: PGS for SIVEST

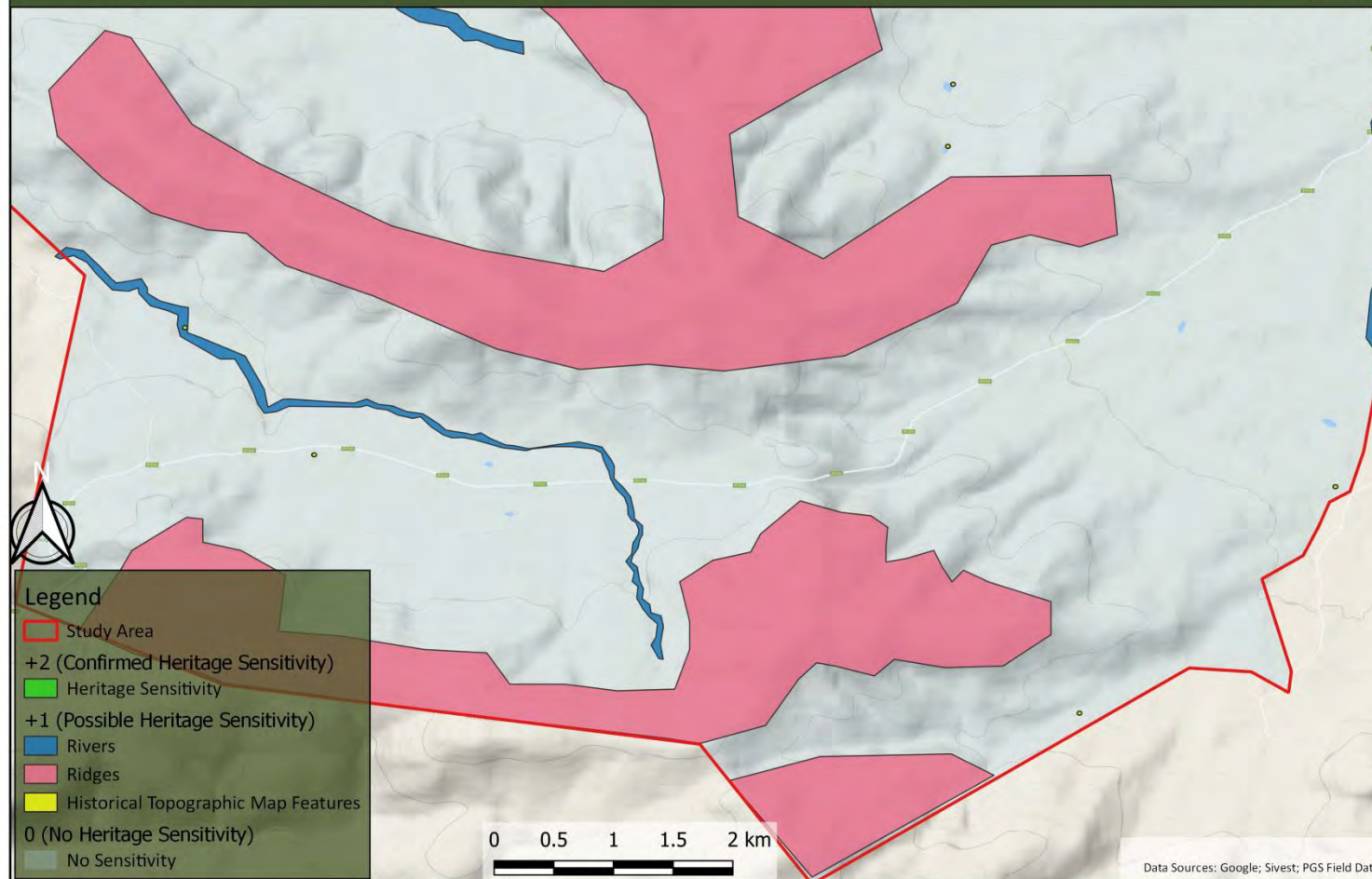


Figure 36 - Sensitivity rating map, South section



**Figure 30, Figure 31, Figure 32, Figure 33, Figure 34, Figure 35 & Figure 36** shows the heritage sensitivity ratings of the study area according to confirmed heritage sites through ground trothing and possible heritage sensitive areas indicated by natural features such as ridges and rivers as well as possible heritage features detected on the archival topographic maps.

## 4.2 Palaeontology

The proposed development site is underlain by the Abrahamskraal Formation, Adelaide Subgroup, of the lower Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Eccca Group (Karoo Supergroup) (**Figure 38** and **Figure 39**). The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. The Beaufort Group of the Karoo Basin consists of a lower Adelaide Subgroup and an upper Tarkastad Subgroup. This group is the focus of palaeontological research in South Africa and are internationally renowned for the early diversification of land vertebrates. The Beaufort Group provide the worlds' most complete transition from early "reptiles" to mammals (Butler, 2018).

### 4.2.1 Eccca Group

#### 4.2.1.1 Waterford Formation

Fossil remains from this formation usually consists of poorly preserved tetrapod bones that could probably belong to the aquatic temnospondyl amphibians. Scattered fish scales and fish coprolites have been recovered as well as several genera of non-marine bivalves. A low diversity of trace assemblages have been described that may belong to the *Scoyenia ichnofacies*. These trace fossils could possibly have been made by small arthropods, earthworms and even insects. Petrified wood of the Glossopteris flora are commonly found in this formation as well as gymnospermous woods namely, *Prototaxoxylon* and *Australoxylon* (Butler, 2018).

### 4.2.2 Beaufort Group

The Beaufort Group has been divided into a series of fossil biozones known as fossil assemblage zones (AZ) (**Figure 5**). These AZ are distinguished by their characteristic tetrapod faunas. The Abrahamskraal Formation is represented by the *Eodicynodon*, *Tapinocephalus* and partially by the *Priesterognathus* Assemblage Zones. The AZ

present in the proposed Rondekop WEF development is most probably the *Tapinocephalus* Assemblage Zone (Butler, 2018).

#### 4.2.2.1 *Tapinocephalus* Assemblage Zone

Vertebrate fossils in this assemblage zone is not as abundantly found as in later assemblage zones. Fossils are generally recovered as single specimens and is often covered by brown-weathering calcareous nodular material. Fauna present in this assemblage zone is mostly large bodied dinocephalians and pareiasaurs. Large *Bradysaurus* specimens are found as complete articulated skeletons and in a dorsal-up position while dinocephalian skulls with associated postcrania are extremely uncommon (**Figure 7**). A few isolated carnivore specimens of gorgonopsia (also known as sabre toothed reptiles), biarmosuchians and therocephalians have been recovered while pelycosaurus are uncommon (Butler, 2018).

The *Tapinocephalus* AZ is also known for large disarticulated amphibians as well as palaeoniscoid bony fish, mostly represented by scattered scales. Gastropods are represented by freshwater bivalves. Fragmentary vascular plant remains include roots, twigs and leaves and petrified wood. Trace fossils are also known from this assemblage zone and include traces of arthropod, tetrapod and worm burrows, tetrapod trackways, fossilized faeces or coprolites and stem and plant casts (Butler, 2018).

Vertebrate fossils found in the Sutherland area include the tapinocephalid and titanosuchid dinocephalians, the pareiasaur *Bradysaurus*, as well as more uncommon dicynodonts, gorgonopsians and therocephalians. Several examples of plant remains have also been documented from this assemblage zone (Butler, 2018).

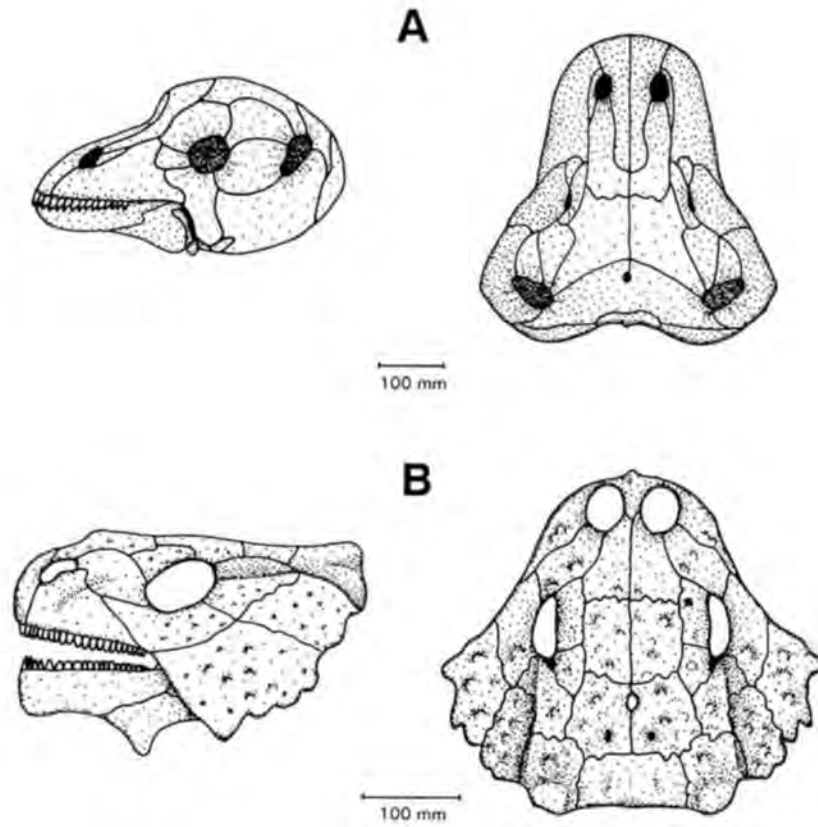


Figure 37 - Fossils characteristic of the Tapinocephalus AZ include A) the dinocephalian therapsid Tapinocephalus and B) the pareiasaur Bradysaurus. Figure taken from (Butler, 2018).

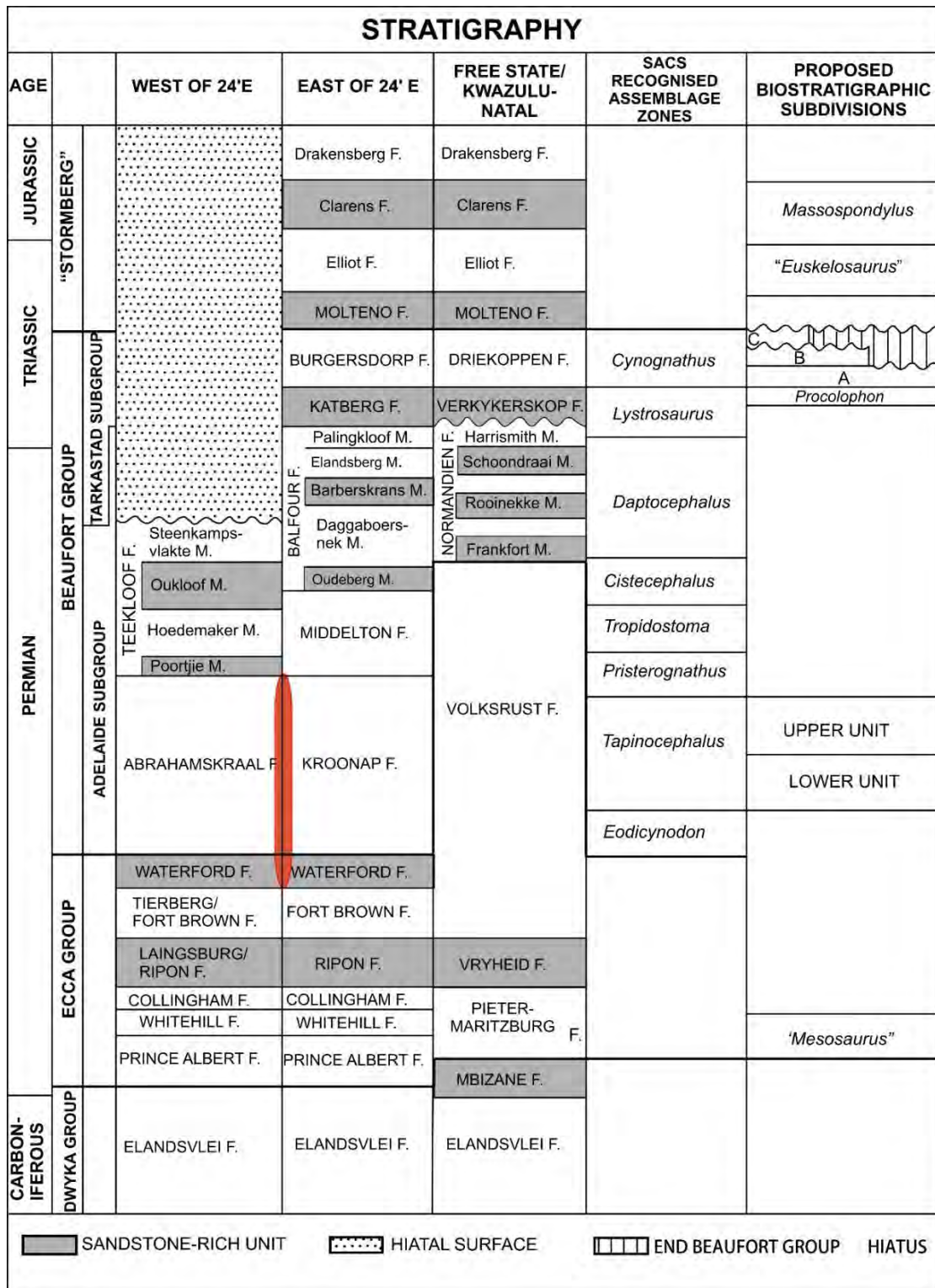


Figure 38 – Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions Beaufort Group of the Karoo Supergroup with rock units and fossil assemblage zones relevant to the present study marked in orange (Modified from Rubidge 1995). Abbreviations: F. = Formation, M. = Member (Figure taken from (Butler, 2018)).

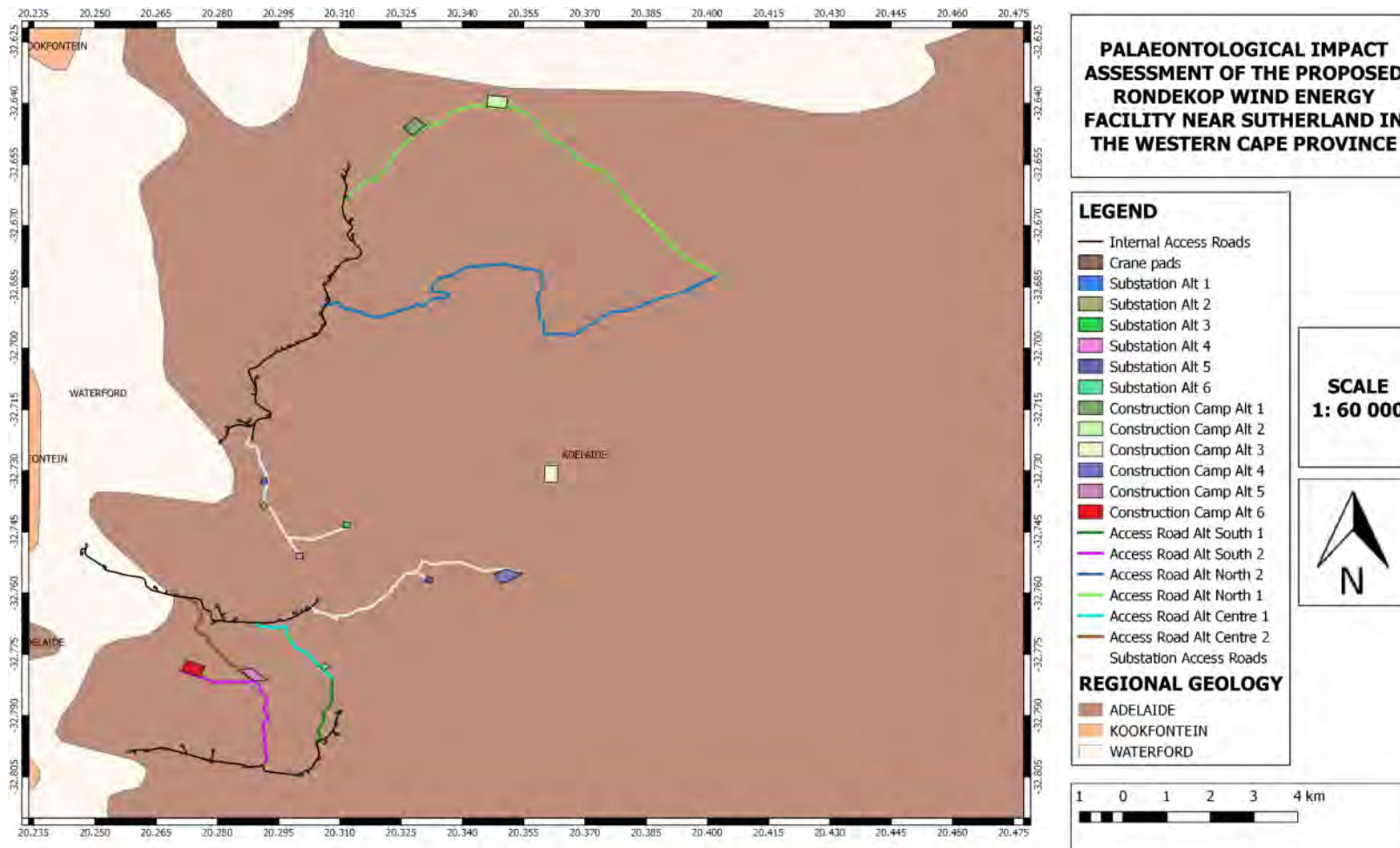


Figure 39 – Surface Geology for the proposed Rondekop Wind Energy Facility near Sutherland in the Western Cape Province. The proposed development site is underlain by the Adelaide Formation of the Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup). Figure taken from (Butler, 2018).

### 4.3 Cultural Landscape

The visual assessment completed by Schwartz et al (2018) for the Rondekop WEF characterised the study area as a *"typical of a Karoo or "platteland" landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa."*

Gibb et al (2018) categorises cultural landscapes as “

- "a landscape designed and created intentionally by man";
- an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
- an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"

They further describe the typical Karoo landscape as consisting of wide-open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Sutherland and Matjiesfontein, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context.

They find that in terms of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, “continuing” landscape.

Schwartz et al (2018) considers that the study area as visible to a viewer thus represents a typical Karoo cultural landscape. They find that this as an important factor in considering visual impacts associated with the development and a potential degrading factor in the context of the Karoo character.

They do however find that visual impacts on the cultural landscape would be reduced by the fact that the area is very remote and there are no significant tourism enterprises attracting visitors into the study area. In addition, the nearest major scenic route, the

R354, is outside the 8km visual assessment zone and is not expected to experience any visual impacts from the proposed WEF.

The cultural landscape in this area is therefore considered to be of low significance and the impacts on the cultural landscape of low significance.

## 5 IMPACT ASSESSMENT

The impact assessment rating is based on the rating scale as contained in **Appendix B** and **Appendix C**.

**Table 2 – Stone Age impact rating**

<b>IMPACT TABLE</b>		
Environmental Parameter	<i>Stone Age find spots and sites</i>	
Issue/Impact/Environmental Effect/Nature	<i>Two types of Stone Age heritage have been identified during the survey; both the find spots and sites rated as having low archaeological significance.</i>  <i>None of the identified find spots or sites will be impacted by construction activities, therefore the impact is seen as negligible.</i>	
<i>Extent</i>	<i>Site</i>	
<i>Probability</i>	<i>Unlikely</i>	
<i>Reversibility</i>	<i>Irreversible</i>	
<i>Irreplaceable loss of resources</i>	<i>The nature of heritage resources is such that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research</i>	
<i>Duration</i>	<i>Permanent</i>	
<i>Cumulative effect</i>	<i>Low</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating</i>	<i>Low negative before mitigation and low negative after mitigation</i>	
	<b>Pre-mitigation impact rating</b>	<b>Post-mitigation impact rating</b>

Extent	1	1
Probability	1	1
Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-16 (low negative)	-15 (low negative)
Mitigation measures	<ol style="list-style-type: none"> <li>1. A chance find protocol will need to be enacted during construction activities.</li> <li>2. A 20m buffer should be applied to all Stone Age find spots and sites.</li> <li>3. Provide ECO with locations and monitor excavations</li> </ol>	

**Table 3 – Colonial buildings impact rating**

<b>IMPACT TABLE</b>		
Environmental Parameter	<i>Colonial buildings and stone walled kraals</i>	
Issue/Impact/Environmental Effect/Nature	<i>Given that these features are in relatively good condition, providing decent data about the historic use of the Rondekop properties, and the early settlement history of the area, all colonial buildings and stone walled kraals have been assigned a medium significance rating.</i>	
<i>Extent</i>	<i>Site</i>	
<i>Probability</i>	<i>Unlikely</i>	
<i>Reversibility</i>	<i>Irreversible</i>	
<i>Irreplaceable loss of resources</i>	<i>The nature of heritage resources is such that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research</i>	
<i>Duration</i>	<i>Permanent</i>	
<i>Cumulative effect</i>	<i>Low</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating</i>	<i>Low negative before mitigation and low negative after mitigation</i>	
	<b>Pre-mitigation impact rating</b>	<b>Post-mitigation impact rating</b>



Extent	1	1
Probability	1	1
Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-16 (low negative)	-15 (low negative)
Mitigation measures	<ol style="list-style-type: none"> <li>1. A 50m buffer should be applied to all Colonial buildings and stone walled kraals.</li> <li>2. Provide ECO with locations and monitor excavations</li> </ol>	

**Table 4 – Impact on monuments (memorials)**

<b>IMPACT TABLE</b>		
Environmental Parameter	<i>Monuments (memorials)</i>	
Issue/Impact/Environmental Effect/Nature	<i>Given that this feature is in relatively good condition, providing data about the historic use of the Rondekop properties, and the early settlement history of the area, this monument been assigned a medium significance rating.</i>	
<i>Extent</i>	<i>Site</i>	
<i>Probability</i>	<i>Unlikely</i>	
<i>Reversibility</i>	<i>Irreversible</i>	
<i>Irreplaceable loss of resources</i>	<i>The nature of heritage resources are such that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research</i>	
<i>Duration</i>	<i>Permanent</i>	
<i>Cumulative effect</i>	<i>Low</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating</i>	<i>Low negative before mitigation and low negative after mitigation</i>	
	<b>Pre-mitigation impact rating</b>	<b>Post-mitigation impact rating</b>
Extent	1	1
Probability	1	1

Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-16 (low negative)	-15 (low negative)
Mitigation measures	1. A 50m buffer should be applied to all monuments.	

**Table 5 – Chance finds impact rating**

<b>IMPACT TABLE</b>		
Environmental Parameter	<i>Unidentified heritage structures, beyond the already surveyed portions of the property.</i>	
Issue/Impact/Environmental Effect/Nature	<i>Due to the size of the area assessed, and the design process requiring surveying before identification of the layout, the possibility of encountering heritage features in non-surveyed areas does exist.</i>	
<i>Extent</i>	<i>Site</i>	
<i>Probability</i>	<i>Possible</i>	
<i>Reversibility</i>	<i>Irreversible</i>	
<i>Irreplaceable loss of resources</i>	<i>The nature of heritage resources are such that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research</i>	
<i>Duration</i>	<i>Permanent</i>	
<i>Cumulative effect</i>	<i>Medium</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating</i>	<i>Low negative before mitigation and low negative after mitigation</i>	
	<b>Pre-mitigation impact rating</b>	<b>Post mitigation impact rating</b>
Extent	1	1
Probability	2	2
Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	2	1

Intensity/magnitude	1	1
Significance rating	-17 (low negative)	-16 (low negative)
Mitigation measures	<ol style="list-style-type: none"> <li>1. An archaeological walk down of the final approved layout will be required before construction commence;</li> <li>2. Any heritage features of significance identified during this walk down will require formal mitigation or where possible a slight change in design could accommodate such resources.</li> <li>3. A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations.</li> <li>4. A chance finds protocol must be develop that include the process of work stoppage, site protection, evaluation and informing SAHRA of such finds and a final process of mitigation implementation.</li> </ol>	

**Table 6 - Palaeontological Impact – Chance Finds**

<b>IMPACT TABLE</b>	
Environmental Parameter	<i>Prevent the loss of Palaeontological Heritage not identified during the site survey.</i>
Issue/Impact/Environmental Effect/Nature	<i>Due to the size of the project and the design method requiring surveying before identification of the layout, there is a possibility to come across fossil heritage not surveyed.</i>
<i>Extent</i>	<i>Site (1)</i>
<i>Probability</i>	<i>Possible (3)</i>
<i>Reversibility</i>	<i>Irreversible (4)</i>
<i>Irreplaceable loss of resources</i>	<i>By taking a precautionary approach, an insignificant loss of fossil resources is expected (<b>No Loss</b>). (1)</i>
<i>Duration</i>	<i>Permanent (4)</i>
<i>Cumulative effect</i>	<i>Low</i>
<i>Intensity/magnitude</i>	<i>Low</i>
<i>Significance Rating</i>	<i>Low</i>
	Pre-mitigation impact rating
	Post mitigation impact rating

Extent	1	1
Probability	3	1
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-14 (negative low)	-12(negative low)
Mitigation measures	<p>Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase.</p> <p>Significant fossil finds to be reported to SAHRA for recording and sampling by a professional palaeontologist</p> <p>Chance find procedure must be followed.</p> <ul style="list-style-type: none"> <li>• When a chance find is made the person must instantly stop all work near the find.</li> <li>• The site must be secured to protect it from any additional damage</li> <li>• The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.</li> <li>• The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.</li> <li>• Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.</li> <li>• These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site</li> <li>• The reports and all other documents will be submitted to SAHRA by the palaeontologist.</li> <li>• The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.</li> <li>• Once the required approvals have been issued, the Mine/development may carry on with the development.</li> </ul>	

	<ul style="list-style-type: none"> <li>The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.</li> </ul>
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**Table 7 - Palaeontological Impact – Construction Phase**

<b>IMPACT TABLE</b>		
Environmental Parameter	Prevent the loss of Palaeontological Heritage	
Issue/Impact/Environmental Effect/Nature	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study.	
<i>Extent</i>	Excavation of the ground surface <i>of the site</i> (1)	
<i>Probability</i>	As fossil heritage is known from these formations the probability of impacts on palaeontological heritage during the construction phase is probable (3).	
<i>Reversibility</i>	Impacts on fossil heritage are usually <b>irreversible</b> . (4)	
<i>Irreplaceable loss of resources</i>	By taking a precautionary approach, an insignificant loss of fossil resources is expected ( <b>No Loss</b> ). (1)	
<i>Duration</i>	The expected duration of the impact is assessed as potentially permanent to <b>long term</b> . In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent (4).	
<i>Cumulative effect</i>	The cumulative effect of the development of the WEF and associated infrastructure within the proposed location is considered to be <b>low</b> . This is as a result of the broader Sutherland area not being considered as fossiliferous.(1)	
<i>Intensity/magnitude</i>	The intensity of the impact on fossil heritage is rated as <b>low (1)</b> .	
	Pre-mitigation impact rating	Post mitigation impact rating

Extent	1	1
Probability	3	1
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-14 (negative low)	-12 (negative low)
Mitigation measures	<p>Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase.</p> <p>Significant fossil finds to be reported to SAHRA for recording and sampling by a professional palaeontologist</p> <p>Chance find procedure must be followed.</p> <ul style="list-style-type: none"> <li>• When a chance find is made the person must instantly stop all work near the find.</li> <li>• The site must be secured to protect it from any additional damage</li> <li>• The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.</li> <li>• The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.</li> <li>• Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.</li> <li>• These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site</li> <li>• The reports and all other documents will be submitted to SAHRA by the palaeontologist.</li> </ul>	

	<ul style="list-style-type: none"> <li>• The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.</li> <li>• Once the required approvals have been issued, the Mine/development may carry on with the development.</li> <li>• The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.</li> </ul>
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The overall impact of the development will be low on the identified heritage resources while the impact will be very high on palaeontological resources. With the implemented mitigation measures these impacts will be reduced to an acceptable level (low).

**Table 8 - No-Go / Status-Quo Alternative**

<b>IMPACT TABLE</b>		
Environmental Parameter	<i>Heritage resources</i>	
Issue/Impact/Environmental Effect/Nature	<i>No impact on identified heritage resource are foreseen if a no-go option is considered</i>	
<i>Extent</i>	<i>Site</i>	
<i>Probability</i>	<i>Possible</i>	
<i>Reversibility</i>	<i>Completely reversible</i>	
<i>Irreplaceable loss of resources</i>	<i>The no-go alternative will have no impact on the identified heritage resources of the study area</i>	
<i>Duration</i>	<i>Permanent</i>	
<i>Cumulative effect</i>	<i>Negligible Cumulative Impact</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating</i>	<i>Low negative before mitigation and low negative after mitigation</i>	
	<b>Pre-mitigation impact rating</b>	<b>Post-mitigation impact rating</b>
Extent	1	1
Probability	1	1

Reversibility	1	1
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-9 (low negative)	-9 (low negative)
Mitigation measures	<i>None required</i>	

## 5.1 Cumulative Impacts (CI)

This section evaluates the possible cumulative impacts (CI) on heritage resources with the addition of the Rondekop WEF. The CI on heritage resources evaluated a 50-kilometer radius (**Figure 40**). It must further be noted that the evaluation is based on available heritage studies (**Figure 41**) and cannot take the findings of outstanding studies on current ongoing EIA's in consideration.

The following must be considered in the analysis of the cumulative effect of development on heritage resources:

- **Fixed datum or dataset:** There is no comprehensive heritage data set for the Sutherland region and thus we cannot quantify how much of a specific cultural heritage element is present in the region. The region has never been covered by a heritage resources study that can account for all heritage resources. Further to this none of the heritage studies conducted can with certainty state that all heritage resources within the study area has been identified and evaluated;
- **Defined thresholds:** The value judgement on the significance of a heritage site will vary from individual to individual and between interest groups. Thus implicating that heritage resources' significance can and does change over time. And so will the tipping threshold for impacts on a certain type of heritage resource;
- **Threshold crossing:** In the absence of a comprehensive dataset or heritage inventory of the entire region we will never be able to quantify or set a threshold to determine at what stage the impact from developments on heritage resources has reached or is reaching the danger level or excludes the new development on this basis. (Godwin, 2011)



Keeping the above shortcomings in mind, the methodology in evaluating cumulative impacts on heritage resources has been as follows.

The analysis of the completed studies as listed in **Table 9 & Table 10**, took into account the findings and recommendations of each of the sixteen evaluated HIA's and thirteen RE EIAs. The cumulative impact on the cultural landscape was discounted as the HIA's, in most cases, did not address this and the Visual Impact Assessment covers such analysis in detail.

The overall findings of the 29 studies all concur that the area is characterised by numerous Stone Age findspots and archaeological resources. Many of these are concentrated around pans and outcrops in a landscape where water, food and shelter came at a premium. The sites around the pans and the outcrops were in most cases given a medium to high heritage significance on a local scale and in the majority of the cases were recommended as being no-go areas or extensive mitigation is required. There are no pans located within the Rondekop project site.

This cumulative assessment has also not addressed the possible cumulative impacts on the heritage landscape. The evaluated studies have in most cases not addressed or quantified the possible impact on the cultural landscape.

**Table 9 & Table 10** provide an analysis of the projected cumulative impact this project will add to impact on heritage resources.

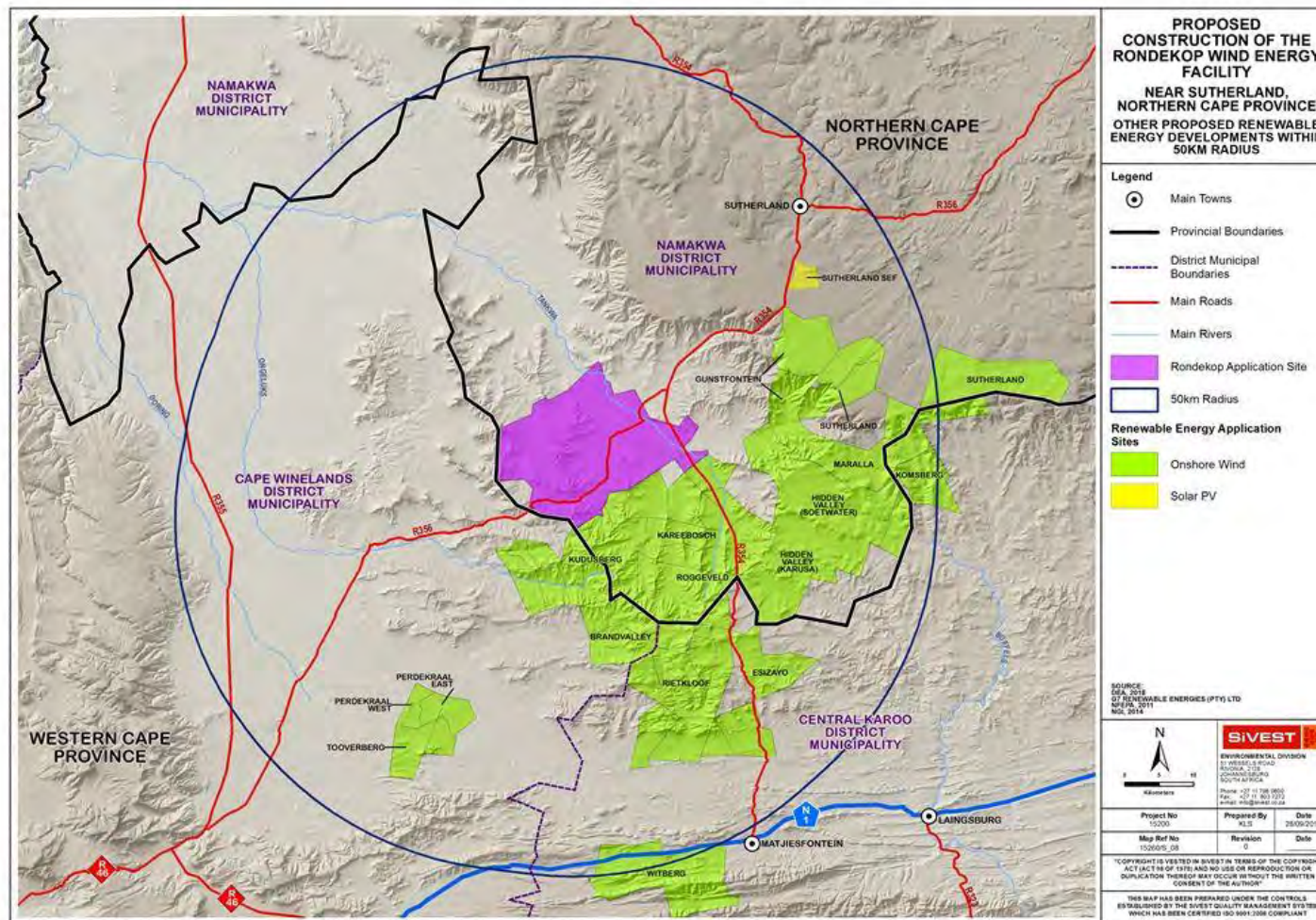


Figure 40 - Other Renewable Energy developments in relation to the Rondekop WEF application area (Sivest 2018)

Rondekop Windfarm Project  
Previous Heritage Impact Assessments within 50km of Study

PGS Heritage (Pty) Ltd  
Heritage Management Unit

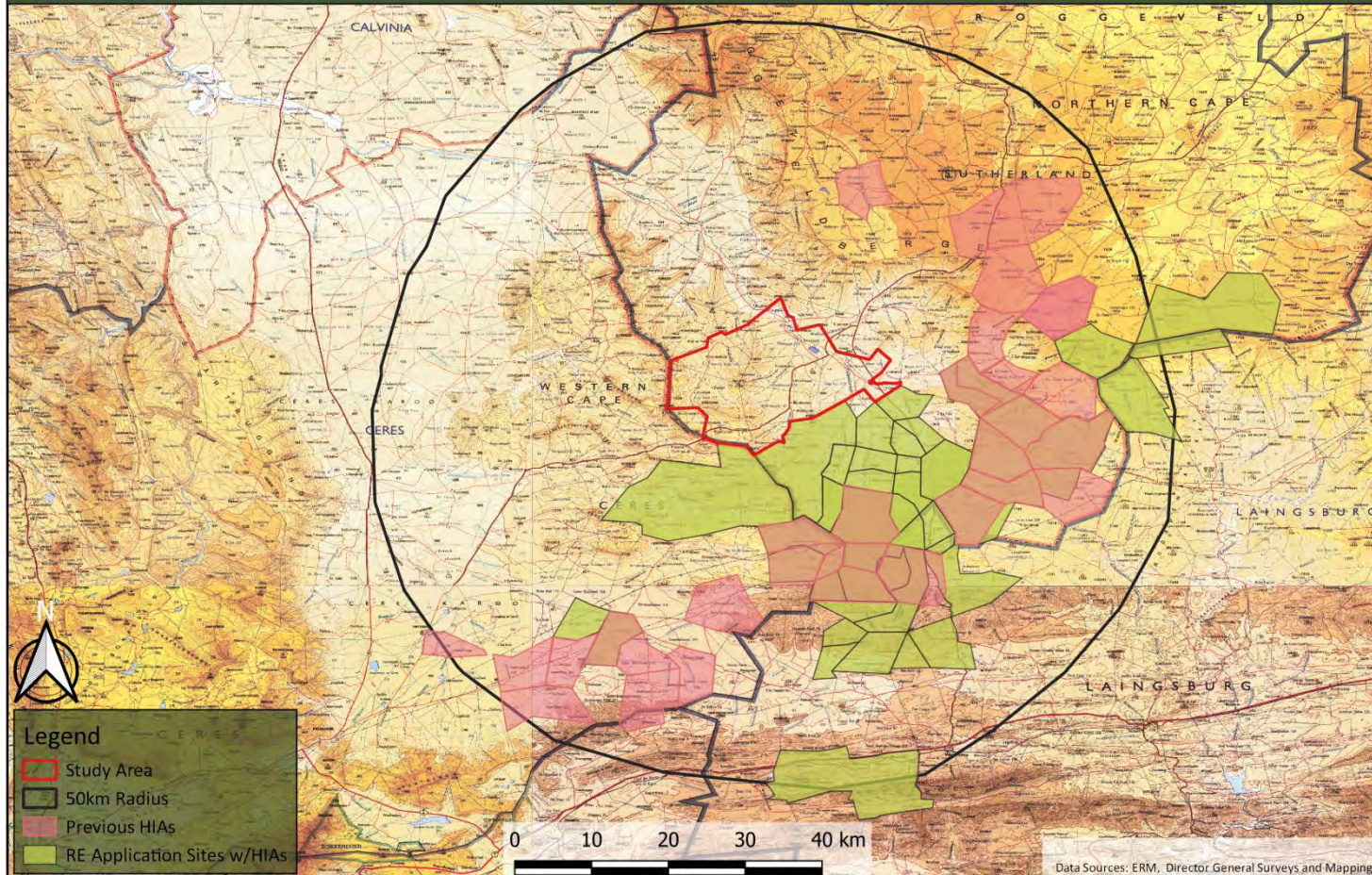


Figure 41 - Other RE developments in relation to the Rondekop WEF application area, where HIAs were completed

**Table 9 – Heritage Impact Assessments conducted within 50km of Rondekop WEF application area**

Study	Findings	Recommendation
ALMOND, J, & ORTON, J. 2017. Heritage Impact Assessment: Proposed Construction of a Substation and 132 kV Distribution Line to support the Proposed Sutherland 2 WEF, Sutherland and Laingsburg Magisterial Districts, Northern and Western Cape.	<i>Historical and Stone Age heritage remains as well as several burial grounds and fossil sites were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that development may continue under the condition that 30m &amp; 20m buffers are implemented around certain 'no-go' sites and that the relevant contingencies are implement should heritage remains be affected by the development process.</li> </ul>
BANDAMA, F. & MOHAPI, M. 2014. An Archaeological Scoping and Assessment Report for The Proposed Gamma (Victoria West, Northern Cape) - Kappa (Ceres – Western Cape) 765Kv (2) Eskom Power Transmission Line.	<i>This scoping report identified a range of heritage resources in and around the local area including: stone walling (kraals and possible windbreaks), ESA-LSA artefact scatters, buildings and farm complexes (with associated artefacts like glass, metal and ceramic), rock art and engravings, pottery and graves (both formal and informal).</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that a detailed walkdown of the powerline options be considered due to high number of sites in the area albeit being of low significance.</li> </ul>
BOOTH, C. 2012. A Phase 1 AIA for the proposed Hidden Valley Wind Energy Facility, near Sutherland, Northern cape Province.	<i>Historical heritage resources were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that an archaeologist be present during all construction related activities in two of the study areas.</li> </ul>
BOOTH, C. 2015. A Phase 1 Archaeological Impact Assessment for the Proposed Karusa Facility Substation and Ancillaries, near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, NC Province.	<i>No significant heritage resources were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.</li> </ul>
BOOTH, C. 2015. A Phase 1 Archaeological Impact Assessment for the Proposed Eskom Karusa Switching Station, Ancillaries and a 132kV Double Circuit Overhead Power Line, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province.	<i>Some low significance Historical heritage remains were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that a 30m buffer around discovered sites be adhered to and that the relevant contingencies are implement should heritage remains be uncovered during the development process.</li> </ul>

Study	Findings	Recommendation
<p>BOOTH, C. 2015. An Archaeological Walk-Through For The Proposed Karusa Wind Energy Facility Situated On The Farms: De Hoop 202, Standvastigheid 210, Portion 1 Of The Farm Rheeboeke Fontein 209, Portion 2 of the Farm Rheeboeke Fontein 209, Portion 3 of the Farm Rheeboeke Fontein 209 and the Remainder Of The Farm Rheeboeke Fontein 209, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province.</p>	<p><i>Historical heritage resources were uncovered in this assessment.</i></p>	<ul style="list-style-type: none"> <li>▪ It was recommended that the historical remains be recorded and a destruction permit be applied for if they are not able to be avoided.</li> </ul>
<p>BOOTH, C. 2015. An Archaeological Walk-Through for the Proposed Soetwater Wind Energy Facility Situated On The Farms: The Remainder Of And Portion 1, 2 And 4 Of Farm Orange Fontein 203 And Annex Orange Fontein 185, Farm Leeuwe Hoek 183 And Farm Zwanepoelshoek 184, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province.</p>	<p><i>No significant heritage resources were uncovered in this assessment.</i></p>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.</li> </ul>
<p>BOOTH, C. 2015. A Phase 1 Archaeological Impact Assessment for the Proposed Soetwater Substation, 132kvV Overhead Powerline and Ancillaries Soetwater Wind Energy Facility, Near Sutherland, Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province.</p>	<p><i>No significant heritage resources were uncovered in this assessment.</i></p>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development may continue and that the relevant contingencies are implement should heritage remains be uncovered during the development process.</li> </ul>

Study	Findings	Recommendation
BOOTH, C. 2015. Phase 1 Archaeological Impact Assessment for the proposed extension of the existing Komsberg Substation (two alternative areas) and widening of the access road, near Sutherland, NC Province.	<i>No heritage remains were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development may continue.</li> </ul>
FOURIE, W. 2010. Archaeological Walk Down Report: Gamma-Omega Transmission Section 1: Gamma-Kappa.	<i>This study identified a range of heritage resources, the majority of which comprise Stone Age artefact scatters of varying densities. These are primarily ESA and MSA scatters, although LSA artefacts were also located. In addition, rock engravings were also found, along with stone walled structures of varied construction (kraals, walls, possible wind breaks); infrequent non-decorated potsherds were sporadic. Later historical structures were also found (with glass, metal and ceramic fragments), along with associated graves/burial areas. The earliest graves place regional occupation pre-1892.</i>	<ul style="list-style-type: none"> <li>▪ The demarcation of sites as “no-go” areas</li> <li>▪ Where the demarcation of sites is not sufficient, and the sites are unavoidable by the development, then mitigation measures must be implemented.</li> </ul>
FOURIE, W., ALMOND, J. & ORTON J. 2014. National Wind and Solar PV SEA Specialist Assessment Report – Heritage Evaluation. This report provides an overview of potential heritage impacts in the REDZ Komsberg focus area 2.	<i>The following types of heritage are listed for this area: Middle and Later Stone Age artefact scatters (frequently associated with water sources), rock art (confined to the mountainous areas), colonial farmsteads (18-19<sup>th</sup> Century – farmhouses, kraals and earth dams), provincial heritage sites (i.e., Matjiesfontein, Karoopoort), South African War period fortifications and cemeteries (dating back to the early 1800s).</i>	<ul style="list-style-type: none"> <li>▪ Mitigation: Adjust buffers through site specific management and incorporation of viewshed analysis from VIA's.</li> <li>▪ Sensitive heritage features such as cultural landscapes and archaeological sites are very localised and can be managed through thorough HIAs as recommended in sensitive areas.</li> </ul>
HALKETT, D. & ORTON, J. 2011. Heritage Impact Assessment for the Proposed Photovoltaic Solar Energy Facility on the Remainder of Farm Jakhalsvalley 99, Sutherland Magisterial District, Western Cape.	<i>Historical heritage resources were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development may continue however, the remains should be avoided and that the ECO must make sure of this.</li> </ul>

Study	Findings	Recommendation
HALKETT, D. 2011. Heritage Impact Assessment Proposed Renewable Energy Facility at the Sutherland Site, Western and Northern Cape Provinces.	<i>Some historical and Stone Age heritage remains as well as a burial ground that was uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that development may continue and that the relevant contingencies are implement should heritage remains be affected by the development process.</li> </ul>
KAPLAN, J. 2009. Phase 1 Archaeological Impact Assessment of the Proposed Driefontein Resort (Driefontein Farm No. 127) Sutherland, Northern Cape Province.	<i>Historical heritage remains were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that the historical remains be avoided and that a Conservation Management Plan be drafted to protect the remains.</li> </ul>
KAPLAN, J. 2015. Proposed borrow pit (Karusa North) on the Farm Rheebokke Fontein 209 Remainder near Sutherland, Northern Cape Assessment conducted under Section 38 (3) of the National Heritage Resource Act (No. 25 of 1999).	<i>Historical, Iron Age and Stone Age heritage remains were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ Relevant sites should be protected, 20m buffers implemented where necessary and that the relevant contingencies are implement should heritage remains be uncovered during the development process.</li> </ul>
KAPLAN, J. 2015. Proposed borrow pit (Karusa East) on the Farm Rheebokke Fontein 209/2 & 209/3 near Sutherland, Northern Cape.	<i>Low significance historical heritage resources were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development may continue and that the relevant heritage authorities should be contacted if any human remains are uncovered during the development process.</li> </ul>
VAN DER RYST, M. & FOURIE, W. 2014. Phase 2 Specialist Study of Affected Stone Age Locality on The Gamma Kappa Transmission Line – Tower GKB-T846 (Site GK062), Tankwa Karoo, Touwsrivier.	<i>This report documents medium density scatters of ESA, MSA and LSA artefacts at a single deflated, secondary context, locality, with the assemblage comprising a very low quantity of formal tools.</i>	<ul style="list-style-type: none"> <li>▪ The mitigation procedure was deemed satisfactory and it was further recommended that a destruction permit may be applied for from SAHRA.</li> </ul>
VAN DER WALT, J. 2015. Archaeological Impact Assessment Report for the Proposed Gunstfontein Wind Energy Facility, Northern Cape.	<i>Historical remains as well as Rock Art were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>▪ It was recommended that the development footprint be updated in order to accommodate the heritage findings and that the ECO must make sure the heritage resources are protected.</li> </ul>

Study	Findings	Recommendation
VAN DER WALT, J. 2016. Archaeological impact assessment report for the proposed Gunstfontein 132 kV power line, switching station and ancillaries for the proposed Gunstfontein wind energy facility near Sutherland, Northern Cape.	<i>Desktop level assessment based of previous fieldwork done in the study area. Historical remains as well as Rock Art was uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>It is recommended that a full heritage walk down of the study area must be conducted.</li> </ul>
WEBLEY, L. 2017. Heritage Impact Assessment: Proposed Construction of the Maralla West Wind Energy Facility near Sutherland in the Northern Cape.	<i>Historical and Stone Age heritage remains were uncovered in this assessment.</i>	<ul style="list-style-type: none"> <li>It was recommended that highly sensitive No-Go area should be avoided, that a walk-down be conducted should the development layout change and that the relevant contingencies are implement should heritage remains be uncovered during the development process.</li> </ul>

**Table 10 - Other proposed renewable projects within 50km of Rondekop WEF application site**

Study	Findings	Recommendation
UCT Environmental Evaluation Unit. 2011. Touwsrivier Solar Energy Facility.	<i>This report anticipates the existence of Middle and Early stone age material in the ploughed lands within the study area while they have confirmed several historical structures relating to South African railway history.</i>	<ul style="list-style-type: none"> <li>A policy of minimal intervention is recommended with respect to the surviving historical railway infrastructure. In terms of archaeology, the site is considered to be insensitive however a walk-over would be required for the transmission lines once a route has been approved.</li> </ul>
ERM. 2012. Proposed renewable energy facility at the Perdekraal Site 2, Western Cape.	<i>No heritage resources were identified with the proposed study area however two small rockshelters, several grave sites and concentration of historical structures were identified within the general vicinity of the study area.</i>	<ul style="list-style-type: none"> <li>If the Ekkraal Valley is to be impacted, then this area has to be thoroughly surveyed and all heritage sites recorded. Sensitive areas must be flagged so that these can be protected from construction related activities.</li> <li>If human remains are uncovered during the construction phase, work in the specific location should cease, and HWC/SAHRA should be notified.</li> </ul>
Savannah Environmental. 2014. Roggeveld Wind farm.	<i>This report identified several stone age tool scatters and historical farm buildings, all of which considered low significance. Further, a number of collapsing stone structures including buildings, kraals, a well, oven and threshing floor were recorded, considered to be of low significance. Additionally, An unfenced graveyard is located on the Rietpoort farm and a number of stone cairns were identified which could represent graves. There is a high probability that additional</i>	<ul style="list-style-type: none"> <li>Avoid disturbance or damage to buildings and structures older than 60 years by maintaining 500m buffers around the on-site dwellings;</li> <li>Avoid inland water bodies (100m buffer) and rivers (200m buffer);</li> <li>Maintain a 200m buffer zone around cemeteries or graves onsite; and</li> <li>Remove turbines from the 'koppie' in the south eastern portion of the site comprising Waaipoort Formation and ensuring palaeontological input prior to or during construction of turbines along the thin band of Whitehill Formation running through the central portion of the Perdekraal farm (Rem of Lower Stinkfontein 245).</li> </ul>



Study	Findings	Recommendation
	<i>unmarked graves will be uncovered during the construction phase.</i>	<ul style="list-style-type: none"> <li>▪ Prior to or during foundation excavations which may be located on the Whitehill Formation, positions and/or excavations must be inspected by a palaeontologist;</li> <li>▪ Buffer zones around built structures should be maintained during the construction phase to prevent damage to structures of heritage interest;</li> <li>▪ Mitigation of the pre-colonial, colonial archaeology and avoidance of marked graves which may not have been identified during the site survey should involve micro-siting prior to construction; and</li> <li>▪ Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to the HWC and/or South African Heritage Resources Agency (SAHRA). After assessment and if appropriate a permit must be obtained from the SAHRA or HWC to remove such remains.</li> </ul>
Savannah Environmental. 2014. Hidden Valley WEF.	This report identified multiple grave sites and historical structural remains. The historical sites are of low significance and the grave sites are of high significance.	<ul style="list-style-type: none"> <li>• A professional archaeologist must be appointed during the construction phase to monitor and identify possible archaeological material remains and features that may occur below the surface and make further appropriate recommendations on removing and/or protecting the archaeological remains and features.</li> <li>• Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to the HWC and/or South African Heritage Resources Agency (SAHRA). After assessment and if appropriate a permit must be obtained from the SAHRA or HWC to remove such remains.</li> <li>• Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.</li> <li>• A 10m buffer zone must be maintained between sites and construction activities where the activities do encroach on the sites.</li> </ul>
Savannah Environmental. 2015. Karreebosch Wind Farm.	This report identified scarce examples of Stone age remains however it found multiple grave sites and historical structural remains. All of which are of low-medium significance save for the grave sites.	<ul style="list-style-type: none"> <li>▪ None of these heritage artefacts/sites occur within the proposed wind turbine development footprint. The pre-colonial heritage of the area as manifested by archaeological traces is extremely sparse. Very little material was identified and no particular mitigation is suggested.</li> <li>▪ If any of the valley bottoms are to be impacted or the valley bottom roads widened, then this area will need to be thoroughly surveyed and all heritage sites recorded and mapped on the landscape. Sensitive areas must be flagged so that these can be protected from construction related activities.</li> </ul>

Study	Findings	Recommendation
EOH. 2016. Proposed Brandvalley WEF.	This report identified scarce examples of Stone age remains however it found multiple grave sites and historical structural remains. All of which are of low-medium significance save for the grave sites.	<ul style="list-style-type: none"> <li>• Once the final layout of the Brandvalley WEF has been established a more intensive survey of these areas should be conducted and further recommendations and further migratory be made.</li> <li>• No development should occur within 20 m – 30 m of the stone walling features and associated historical artefacts. The features should be clearly demarcated before any development activities begin to avoid any negative impact. The layout of any infrastructure should be reconsidered to preserve these heritage resources.</li> <li>• The graveyard is already fenced off, however, the area should be clearly demarcated and the upgrade of the road be to the west or the road be diverted further away to avoid any possible negative impact to the graveyard.</li> <li>• Effective rehabilitation of the landscape after decommissioning.</li> <li>• Recommendations for the establishment of 20 m – 30 m buffer zones that are clearly demarcated and in some instances the possible rerouting of the proposed road to avoid negative impact and promote the implementation of precautionary measures be adopted for heritage resources occurring along the route.</li> <li>• If any of the old farm buildings are to intended for rehabilitation or re-use or demolition a qualified and experienced professional (historical archaeologist / historical architect) must be consulted.</li> <li>• No turbines are to be located on Tafelkop or Spitskop.</li> <li>• An archaeological heritage walk-through survey must be conducted if any changes to the positions of the wind turbines, associated infrastructure and roads outside the scope of this study are made for the final layout and further recommendations and mitigation measures be suggested if necessary.</li> <li>• If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including burials and graves) are uncovered during construction, all work within close vicinity of the find must cease immediately and be reported the South African Heritage Resources Agency (SAHRA) (021 462 4502) or Heritage Western Cape (HWC) (021 483 5959) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities within the specific area can continue.</li> </ul>

Study	Findings	Recommendation
		<ul style="list-style-type: none"> <li>Construction managers/foremen and/or the ECO should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.</li> </ul>
EOH. 2016. Proposed Rietkloof WEF.	This report identified scarce examples of Stone age remains however it found multiple grave sites and historical structural remains. All of which are of low-medium significance save for the grave sites.	<ul style="list-style-type: none"> <li>It would be difficult to avoid encountering Precolonial / Stone Age artefact scatters within areas they occur. Once the final layout of the Rietkloof WEF has been established a more intensive survey of these areas should be conducted and further recommendations and further mitigatory be made to assist with micro-sitting.</li> <li>No development should occur within 20 m – 30 m of Stone Walling Features and associated Historical Artefact Scatters. The features should be clearly demarcated before any development activities begin to avoid any negative impact. The layout of any infrastructure should be</li> <li>The graveyard is already fenced off, however, the area should be clearly demarcated and the upgrade of the road be to the west or the road be diverted further away to avoid any possible negative impact to the graveyard.</li> <li>It is strongly recommended that any proposed access roads avoid using these homesteads as a thoroughfare for the proposed wind energy facility as far as possible.</li> <li>Effective rehabilitation of the landscape after decommissioning.</li> <li>No turbines are to be constructed on Tafelkop.</li> <li>If any of the old farm buildings are to intended for rehabilitation or re-use or demolition a qualified and experienced professional (historical archaeologist / historical architect) must be consulted.</li> <li>An archaeological heritage walk-through survey must be conducted if any changes to the positions of the wind turbines, associated infrastructure and roads outside the scope of this study are made for the final layout and further recommendations and mitigation measures be suggested if necessary.</li> <li>If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including burials and graves) are uncovered during construction, all work within close vicinity of the find must cease immediately and be reported the South African Heritage Resources Agency (SAHRA) (021 462 4502) or Heritage Western Cape (HWC) (021 483 5959) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual</li> </ul>

Study	Findings	Recommendation
		<p>status of the sites and possibly remove the archaeological deposit before development activities within the specific area can continue.</p> <ul style="list-style-type: none"> <li>• Construction managers/foremen and/or the Environmental Control Officer (ECO) should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.</li> </ul>
<p>WSP. 2017. Proposed Esizayo Wind Energy Facility near Laingsburg, Western Cape</p>	<p>This report identified the following heritage resources:</p> <ul style="list-style-type: none"> <li>• A few large scatters of LSA stone artefacts were identified. They are of medium significance;</li> <li>• A few “pastoralist settlements” were identified containing LSA artefacts, ceramics and grindstones along dry river beds in the bottom of valleys. They are of medium significance;</li> <li>• At least two rock art sites. They are of high significance;</li> <li>• The Nuwerus cemetery is located next to the R354. There are also several other potential graves/cairns within the study area. They are of high significance;</li> <li>• A spread of early 20th century historical material on the lower slopes of two koppies, in association with several stone enclosures (fortifications) on the farm Aanstoot. They may represent the debris from the South African War; and</li> <li>• There are numerous roughly-packed, circular enclosures of dry stone walling, which may represent both pre-colonial and colonial era stone kraals, distributed along the lower slopes of small koppies, and close to streams or fountains across the study area. They are of low to medium significance.</li> </ul>	<p>The following mitigation and management measures have been recommended:</p> <ul style="list-style-type: none"> <li>▪ Construction Phase <ul style="list-style-type: none"> <li>○ The hill and surrounds on which substation alternative 1 is located, must be declared a “No-Go” area;</li> <li>○ The Nuwerus cemetery must be protected during the construction phase; and</li> <li>○ If any human remains are uncovered during the excavations for the Wind Farm, work must stop in that area and HWC must be alerted immediately.</li> </ul> </li> <li>▪ Operational Phase: <ul style="list-style-type: none"> <li>○ Any abandoned farm buildings and the established cemetery should be protected from vandalism during the operational phase of the wind farm.</li> </ul> </li> </ul>

Study	Findings	Recommendation
<p>WSP. 2017. Proposed Maralla East Wind Energy Facility near Sutherland, Northern and Western Cape.</p>	<p>This report identified the following heritage resources:</p> <ul style="list-style-type: none"> <li>• A large and informal graveyard (at least 5-10 graves) on the banks of the Komsberg River in the southern portion of the farm Schalkwykskraal, associated with 19th century historic remains and a nearby stone kraal;</li> <li>• Also on the Komsberg River, are the remains of a late 19th century stone stockpost, with small dwelling and extensive stone kraal complex;</li> <li>• Extensive archaeological and colonial period sites is along the Ventersrivier on the farm Welgemoed, including stone artefact scatters, rock art as well as ruined farm buildings, kraals, stockposts and graves.</li> </ul>	<p>The following mitigation and management measures have been recommended:</p> <p>It is expected that most of the damage to the heritage resources on Maralla East will occur during construction. Heritage sites are concentrated along river valleys, while the turbines are generally located along the tops of the mountain ridges. Therefore the following activities may result in direct impacts to the landscape and any heritage that lies on it:</p> <ul style="list-style-type: none"> <li>• Bulldozing of roads across river valleys to the turbine sites;</li> <li>• Upgrading of existing roads particularly where they cut through river valleys or are in close proximity to existing settlements (i.e. farmhouse of Welgemoed);</li> <li>• Excavation of linear trenches for cables through river valleys, resulting in destruction of archaeological sites or graves on the banks of the rivers</li> </ul> <p>During the operational phase of the wind facility the only risks are potential vandalism of heritage sites by staff of the wind facility(s). This includes stripping of fittings from abandoned farm buildings, careless damage to kraal walls, graffiti on rock art sites, etc. No further impacts to heritage would occur during operation of the currently proposed facility, although any expansion to the facility (effectively a new construction phase), would introduce new impacts.</p> <ul style="list-style-type: none"> <li>• In the case of Maralla East WEF, the proximity of the blue substation to the rock art site on the Venters Rivier may result in damage (graffiti) during the operational life of the wind farm (;</li> <li>• Similarly, the potential adaptive re-use of the Welgemoed farmhouse may result in vandalism and damage</li> </ul>
<p>WSP. 2017. Proposed Maralla West Wind Energy Facility near Sutherland, Northern and Western Cape.</p>	<p>This report identified the following heritage resources:</p> <ul style="list-style-type: none"> <li>• Several well-defined LSA sites with relatively abundant artefactual material (including Khoekhoen pottery) associated with water sources such as small streams and spring. These “pastoralist” sites are found on sandy river banks, often in proximity to later colonial sites. There are</li> </ul>	<p>The following mitigation and management measures have been recommended:</p> <p>It is expected that most of the damage to the heritage resources on Maralla West will occur during construction. Heritage sites are concentrated along river valleys, while the turbines are generally located along the tops of the mountain ridges. Therefore the following activities may result in direct impacts to the landscape and any heritage that lies on it:</p> <ul style="list-style-type: none"> <li>• Bulldozing of roads across river valleys to the turbine sites;</li> </ul>

Study	Findings	Recommendation
	<p>numerous stone kraals and abandoned stockpost dwellings in the same area;</p> <ul style="list-style-type: none"> <li>Remains of a large, late 19th century settlement, on Drie Roode Heuvels, on both sides of the public gravel road. It comprises a series of kraal complexes to the west of the road, as well as a threshing floor (trapvloer) and a wide distribution of 19th century ceramics and glass. This site has been bisected by the gravel road, as the graveyard, containing at least 12-15 Christian style graves, is located to the east of the road. There is also extensive stone walling, on both sides of the road.</li> </ul>	<ul style="list-style-type: none"> <li>Upgrading of existing roads particularly where they cut through river valleys or are in close proximity to existing settlements (i.e. farmhouse of Wolven Hoek);</li> <li>Construction of electrical infrastructure in the form of substations</li> </ul> <p>During the operational phase of the wind facility the only risks are potential vandalism of heritage sites by staff of the wind facility(s). This includes stripping of fittings from abandoned farm buildings, careless damage to kraal walls, graffiti on rock art sites, etc. No further impacts to heritage would occur during operation of the currently proposed facility, although any expansion to the facility (effectively a new construction phase), would introduce new impacts.</p> <ul style="list-style-type: none"> <li>The potential adaptive re-use of the Wolven Hoek or Die Kom farmhouses may result in vandalism and damage</li> </ul>
<p>Savannah Environmental. 2016. Gunstfontein Wind Energy Facility, Northern Cape Province.</p>	<p>This report identified the following heritage resources:</p> <ul style="list-style-type: none"> <li>South African War fortifications</li> <li>Rock art sites</li> <li>Stone cairns</li> <li>Historical stone ruins (farm labourer dwellings)</li> </ul>	<p>The following mitigation and management measures have been recommended:</p> <ul style="list-style-type: none"> <li>The majority of sites identified in this study will not be directly impacted by the proposed development.</li> <li>However, where necessary, it is recommended that all proposed infrastructure respect a 60m buffer zone around all sites and;</li> <li>If development takes place particularly close to a site, then that site must be demarcated during construction.</li> </ul>
<p>CSIR. 2016. Amendment Application for the Proposed Splitting of the Sutherland Renewable Energy Facility into three 140 MW Wind Energy Facilities, Sutherland, Northern and Western Cape Provinces.</p>	<p>This report identified the following heritage resources:</p> <ul style="list-style-type: none"> <li>Several colonial stone structures</li> <li>Possible graves</li> <li>Possible KhoeKhoe hunting hides</li> <li>Later Stone Age sites</li> </ul>	<p>The following mitigation and management measures have been recommended:</p> <ul style="list-style-type: none"> <li>A field survey must be undertaken by a palaeontologist prior to any construction taking place;</li> <li>A few LSA sites containing ceramics and occasional formal stone microliths were identified. These often occur in the lee of ridges and near water sources. Some of these have been accorded high significance and have to be avoided.</li> <li>A number of colonial household dumps/refuse heaps were recognised associated with domestic elements of the built environment. Some of these are considered to be of high significance and have to be avoided;</li> <li>Unoccupied standing historic farm buildings as well as ruins are found on Welgemoed and De Kom. These would be accorded high significance and have to be avoided.</li> </ul>

Study	Findings	Recommendation
		<ul style="list-style-type: none"> <li>• A more detailed survey must be conducted along the proposed access roads and connecting cable routes and turbine sites to ensure graves are not disturbed;</li> <li>• If unmarked graves are uncovered during construction, work should cease in that area and either SAHRA or HWC must be notified, depending on the location. A protocol to deal with accidentally discovered burials must be compiled for the construction phase.</li> </ul>
<p>Environmental Evaluation Unit. 2011. The Proposed Photovoltaic Solar Energy Facility on a site south of Sutherland, Northern Cape Province.</p>	<p>This report identified the following heritage resources:</p> <ul style="list-style-type: none"> <li>▪ Several scatters of stone artefacts were recorded in open areas.</li> <li>▪ One rock art site, lying in a long, shallow shelter which also contains some piled stone walling forming a small enclosure.</li> <li>▪ Several pre-colonial stone walled structures.</li> <li>▪ Several sites were found with scatters of historical artefacts. These artefacts include fragments of glass, metal, ceramics.. Some are associated with the historical use of the area, perhaps having been left by shepherds, but others are more likely connected with the Anglo-Boer War.</li> <li>▪ Stone-walled sites can be regarded as historical for the regularity of their shapes and the fact that the stones are relatively neatly placed on top of one another, often in courses. These could include huts, kraals, and animal cages.</li> <li>▪ A number of ruined structures relating to the second Anglo-Boer War were found.</li> </ul>	<p>The following mitigation and management measures have been recommended:</p> <ul style="list-style-type: none"> <li>▪ The Environmental Control Officer (ECO) is to ensure that no-one removes any artefacts from the area.</li> <li>▪ The ECO is to ensure that no-one damages the sites.</li> <li>▪ As the site has been shifted slightly to the east, it is recommended that an archaeologist shall be contracted to visit the site after the development footprint has been pegged on site, but before construction commences, to search for and ensure that no ephemeral heritage resources (specifically stone -built structures) are found within the facility footprint and are lost without suitable recording due to construction activities.</li> </ul>

**Table 11 - Impact rating – Cumulative**

<b>IMPACT TABLE</b>		
Environmental Parameter	<i>Heritage Resources</i>	
Issue/Impact/Environmental Effect/Nature	<i>The extent that the addition of this project will have on the overall impact of developments in the region on heritage resources</i>	
Extent	<i>Regional</i>	
Probability	<i>Possible</i>	
Reversibility	<i>Irreversible</i>	
Irreplaceable loss of resources	<i>The nature of heritage resources are such that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research</i>	
Duration	<i>Permanent</i>	
Cumulative effect	<i>It is my considered opinion that this additional load on the overall impact on heritage resources will be low. With a detailed and comprehensive regional dataset this rating could possibly be adjusted and more accurate.</i>	
Intensity/magnitude	<i>Low</i>	
Significance Rating	<i>Low negative impact before mitigation and low negative after mitigation.</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	2	1
Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-19 (Low negative)	-18 (Low negative)



Mitigation measures	All projects should implement their specific mitigation measures on a case by case basis.
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**Table 12 - Rating of Cumulative Impacts – Palaeontology**

<b>IMPACT TABLE</b>	
Environmental Parameter	<i>Prevent the loss of Palaeontological Heritage</i>
Issue/Impact/Environmental Effect/Nature	<i>Damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study, this will occur during vegetation clearance or during the construction phase</i>
Extent	<i>National (3)</i>
Probability	<i>Since fossil heritage is known from these formations the probability of impacts on palaeontological heritage during the construction phase is probable. (3)</i>
Reversibility	<i>Impacts on fossil heritage are generally <b>irreversible</b> (4)</i>
Irreplaceable loss of resources	<i>By taking a precautionary approach, an insignificant loss of fossil resources is expected (<b>No Loss</b>). (1)</i>
Duration	<i>The expected duration of the impact is assessed as potentially permanent to <b>long term</b>. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. (4)</i>
Cumulative effect	<i>The cumulative effect of the development of the WEF and associated infrastructure within the proposed location is considered to be <b>low</b>. This is as a result of the broader Sutherland area not being considered as fossiliferous (1).</i>
Intensity/magnitude	<i>Probable significant impacts on palaeontological heritage during the construction phase are high, but the intensity of the impact on fossil heritage is rated as low as fossil heritage</i>

	<i>is not common in the development area or in the greater Sutherland area (1)</i>	
Significance Rating	<i>Should the project progress without due care to the possibility of fossils being present at the proposed site in the Abrahamskraal Formation and Waterford Formation. The resultant damage, destruction or inadvertent relocation of any affected fossils will be <b>permanent and irreversible</b>. Thus, any fossils occurring within the area are potentially scientifically and culturally significant and any negative impact on them would be of <b>high</b> significance (without the implementation of mitigation measures).</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	3	1
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-16 (negative low)	-14 (negative low)
Mitigation measures	<p>Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase.</p> <p>Significant fossil finds to be reported to SAHRA for recording and sampling by a professional palaeontologist</p> <p>The chance find procedure must be followed.</p> <ul style="list-style-type: none"> <li>• When a chance find is made the person must instantly stop all work near the find.</li> <li>• The site must be secured to protect it from any additional damage</li> <li>• The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.</li> </ul>	

	<ul style="list-style-type: none"> <li>• The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.</li> <li>• Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.</li> <li>• These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site</li> <li>• The reports and all other documents will be submitted to SAHRA by the palaeontologist.</li> <li>• The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.</li> <li>• Once the required approvals have been issued, the Mine/development may carry on with the development.</li> </ul> <p>The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan</p>
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Overall, the area does contain many instances of Historical and Stone Age heritage resources. While there are a fair number of sites there are few that, in my considered opinion, would have high heritage significance.

It is due to this, coupled with the fact that the development layout of the Rondekop WEF should not have any impact on heritage resources, that the additional load on heritage resources will be low. With a detailed and comprehensive regional dataset this rating could possibly be adjusted and more accurate.

## 5.2 Comparative Assessment of Layout Alternatives (Heritage)

### Key

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>ACCESS ROADS</b>		
<b>NORTH RIDGE</b>		
Access Road Alternative North 1	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Access Road Alternative North 2	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
<b>CENTRE RIDGE</b>		
Access Road Alternative Centre 1	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Access Road Alternative Centre 2	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
<b>SOUTHERN RIDGE</b>		
Access Road Alternative South 1	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Access Road Alternative South 2	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
<b>CONSTRUCTION CAMPS</b>		
Construction Camp Alternative 1	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Construction Camp Alternative 2	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Construction Camp Alternative 3	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Construction Camp Alternative 4	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.

Alternative	Preference	Reasons (incl. potential issues)
Construction Camp Alternative 5	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Construction Camp Alternative 6	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
<b>SUBSTATIONS</b>		
Substation Alternative 1	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Substation Alternative 2	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Substation Alternative 3	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Substation Alternative 4	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Substation Alternative 5	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.
Substation Alternative 6	<b>NO PREFERENCE</b>	There are no known heritage resources in the vicinity.

### 5.3 Comparative Assessment of Layout Alternatives (Palaeontology)

#### Key

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>ACCESS ROADS</b>		
<b>NORTH RIDGE</b>		

<b>Alternative</b>	<b>Preference</b>	<b>Reasons (incl. potential issues)</b>
Access Road Alternative North 1	No Preference	No Fossil Heritage was recovered
Access Road Alternative North 2	No Preference	No Fossil Heritage was recovered
<b>CENTRE RIDGE</b>		
Access Road Alternative Centre 1	No Preference	No Fossil Heritage was recovered
Access Road Alternative Centre 2	No Preference	No Fossil Heritage was recovered
<b>SOUTHERN RIDGE</b>		
Access Road Alternative South 1	No Preference	No Fossil Heritage was recovered
Access Road Alternative South 2	No Preference	No Fossil Heritage was recovered
<b>CONSTRUCTION CAMPS</b>		
Construction Camp Alternative 1	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 2	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 3	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 4	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 5	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 6	No Preference	No Fossil Heritage was recovered
<b>SUBSTATIONS</b>		
Substation Alternative 1	No Preference	No Fossil Heritage was recovered
Substation Alternative 2	No Preference	No Fossil Heritage was recovered

Alternative	Preference	Reasons (incl. potential issues)
Substation Alternative 3	No Preference	No Fossil Heritage was recovered
Substation Alternative 4	No Preference	No Fossil Heritage was recovered
Substation Alternative 5	No Preference	No Fossil Heritage was recovered
Substation Alternative 6	No Preference	No Fossil Heritage was recovered

## 6 CONCLUSIONS AND RECOMMENDATIONS

PGS Heritage (Pty) Ltd was appointed by SiVEST SA (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) for the development of a Wind Energy Facility (WEF) and associated infrastructure, on parts the following farms:

- Remainder and Portion 1 of the Farm Roodeheuvel 170;
- Remainder and Portion 1 of the Farm Wind Heuvel 190;
- Remainder and Portion 1 of the Farm Bloem Fontein 192;
- Portion 1 and 2 of the Farm Urias Gat 193;
- Remainder, Portion 1 and 3 of the Farm Venters Kraal 166;
- Farm Ashoek 224;
- Remainder of the Farm 220;
- Portion 1 of the Farm Lange Huis 174;
- Remainder of the Farm Vinke Kuil 171; and
- Farm Zeekoegat 169.
- Remainder of the Farm Hout Hoek 191

The proposed development is situated approximately 45km south west of Sutherland in the Karoo Hoogland Local Municipality in the Namakwa District Municipality within the Northern Cape Province.

Heritage resources are unique and non-renewable and as such any impact on such resources must be viewed significant.

Due to the nature of cultural remains, a systematic controlled-exclusive surface survey was conducted on foot and in a vehicle, over a period of four days by two archaeologists from PGS. The fieldwork was conducted on the 20<sup>th</sup>-24<sup>th</sup> September 2018. An additional site assessment was also conducted by a Palaeontologist from PGS on the 1<sup>st</sup> – 3<sup>rd</sup> October 2018. The locations of five (5) individual heritage sites were identified during the field survey, all of them falling within the boundaries of the study area.

## 6.1 Archaeology

The archaeological resources identified within the proposed development site comprise a small number of Stone Age surface artefact scatters. These are primarily from the Later Stone Age (LSA), although Middle Stone Age (MSA) material was also identified. All these artefact assemblages occur in heavily deflated and eroded areas, so their scientific potential and heritage significance is somewhat lowered. Based on findings from a range of other heritage reports in the area, these types of sites are to be expected in this region.

The remaining heritage features included buildings and stone walled structures that are likely the result of early European settlement in the area. Most of these features are likely over 60 years of age and for this reason are protected by current heritage law.

Even though heritage features were detected within the development area, serious mitigation measures will not be required except for the implementation of a chance-finds protocol. However, if the development layout is altered, this position will need to be reevaluated.

## 6.2 Palaeontology

The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Rondekop WEF development will be of a low significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the **construction of the development may be authorised in its whole extent**, as the development footprint is not considered sensitive in terms of palaeontological resources. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.



### 6.3 Cultural Landscape

The visual assessment completed by Schwartz et al (2018) for the Rondekop WEF characterised the study area as a “*typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa.*”

They do however find that visual impacts on the cultural landscape would be reduced by the fact that the area is very remote and there are no significant tourism enterprises attracting visitors into the study area. In addition, the nearest major scenic route, the R354, is outside the 8km visual assessment zone and is not expected to experience any visual impacts from the proposed WEF.

The cultural landscape in this area is therefore considered to be of low significance and the impacts on the cultural landscape of low significance.

### 6.4 General

In the event that heritage resources are discovered during site clearance, construction activities must stop in the immediate vicinity of the find, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

The overall impact of the WEF and its associated infrastructure, on the heritage and palaeontological resources identified during this report, is seen as low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised. It is consequently recommended that no further palaeontological and heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. There are no preferences in terms of the proposed layout alternatives as none of them will affect known heritage resources thus no mitigation measures will be required, except for the implementation of a chance-finds protocol. However, if the development layout is altered, this position will need to be reevaluated.

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## Appendix A

# Legislative Requirements – Terminology and Assessment Criteria



The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation -

- NEMA;
- National Heritage Resources Act (NHRA) Act 25 of 1999; and
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002.

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

GNR 982 of 2014 (Government Gazette 38282) promulgated under the NEMA:

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Impacts Report (EIR) – Regulation 23
- EMPr – Regulations 19 and 23
- NHRA:
  - Protection of Heritage Resources – Sections 34 to 36; and
  - Heritage Resources Management – Section 38
- MPRDA Regulations of 2014:
  - Environmental reports to be compiled for application of mining right – Regulation 48.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34 (1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...”. The NEMA (Act No 107 of 1998) states that an integrated EMP should, (23 -2 (b)) “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”. In accordance with legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and the Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive legally compatible HIA report is compiled.



## Appendix B

# Heritage Assessment Methodology

The applicable maps, tables and figures are included, as stipulated in the NHRA (Act No 25 of 1999) and NEMA (Act No 107 of 1998). The HIA process consisted of three steps;

Step I – Literature Review - The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey - A physical survey was conducted predominantly by foot within the proposed areas by two qualified archaeologists, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of identified heritage sites are based on four main criteria -

Site integrity (i.e. primary vs. secondary context),

Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),

Density of scatter (dispersed scatter)

- Low - <10/50m<sup>2</sup>
- Medium/High - 10-50/50m<sup>2</sup>
- High - >50/50m<sup>2</sup>
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows -

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

Impacts on these sites by the development will be evaluated as follows -

Site Significance

Site significance classification standards prescribed by the SAHRA (2006) and approved by the ASAPA for the Southern African Development Community (SADC) region, were used for the purpose of this report (**Table 1 -** ).

**Table 1 - Site significance classification standards as prescribed by SAHRA.**

<b>FIELD RATING</b>	<b>GRADE</b>	<b>SIGNIFICANCE</b>	<b>RECOMMENDED MITIGATION</b>
National Significance (NS)	Grade 1		Conservation; National Site nomination
Provincial Significance (PS)	Grade 2		Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)		High / Medium/High Significance	Mitigation before destruction
Generally Protected B (GP.A)		Medium/High Significance	Recording before destruction
Generally Protected C (GP.A)		Low Significance	Destruction



## Appendix C

# The Significance Rating Scales for the Proposed Prospecting Activities on Heritage Resources

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 3.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

### *Impact Rating System*

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

#### *7.1.1 Rating System Used to Classify Impacts*

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

<b>NATURE</b>		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
<b>GEOGRAPHICAL EXTENT</b>		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
<b>PROBABILITY</b>		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
<b>REVERSIBILITY</b>		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
<b>IRREPLACEABLE LOSS OF RESOURCES</b>		

This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
<b>DURATION</b>		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
<b>CUMULATIVE EFFECT</b>		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects



3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
<b>INTENSITY / MAGNITUDE</b>		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
<b>SIGNIFICANCE</b>		
<p>Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:</p> <p><b>(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.</b></p>		

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.



# Appendix D

## Project team CV's

**ILAN SMEYATSKY**  
**Professional Archaeologist**

Personal Details

**Name:** Ilan  
**Surname:** Smeyatsky  
**Identity Number:** 9109275072080  
**Date of Birth:** 27-09-1991  
**Citizenship:** South African  
**Gender:** Male  
**Marital Status:** Single  
**Languages Spoken:** English

Education History

2010-2013: BSc Bachelors Degree

University of the Witwatersrand, Johannesburg, South Africa

Archaeology

Psychology

Statistics

Research Design and Analysis

67% Pass (2:1 Qualification)

2014: BSc (Hons) in Archaeology

**AWARDS:**

Received the 2014 Center of Excellence in Palaeoscience award - Bursary to the value of ZAR 30000 ≈ \$2500

Received the Post-Graduate Merit Award in 2015 for academic merit for my Honours academic results - Bursary to the value of ZAR 25000 ≈ \$1800

University of the Witwatersrand, Johannesburg, South Africa

Archaeology

Excavation techniques

Theory

69% Pass (2:1 Qualification)

**Distinction** received for thesis entitled: “Stylistic variation in Later Stone Age tanged arrowheads: a pilot study using geometric morphometrics”

2015-2017: MSc by Research (Archaeology)

University of the Witwatersrand, Johannesburg, South Africa

Archaeology

Statistical analysis

GIS (Geographic Information Systems)

Thesis entitled: “Discerning and explaining shape variations in Later Stone Age tanged arrowheads, South Africa”

Aug 2016 –

Jan 2017: Semester of Archaeology Masters

**AWARD:** Received the 2016 AESOP+ full Masters scholarship to study at Uppsala University, Uppsala, Sweden – **Scholarship to the value of ZAR 160,000 ≈ \$11,000**

Uppsala University, Uppsala, Sweden

Archaeological theory

GIS (Geographic Information Systems)

Invitational research

Employment History

Part time employment as a student:

**2009-2013:** Part-Time Electrician Apprentice: Assisting in home electrical repair jobs.

**2014-2015:** Lab Research Assistant: Analysing and classifying lithic artefacts, Data capturing, Mentoring trainee research assistants.

Experience in the field of archaeology:

**2013-2015: Fieldwork/Excavator - Responsibilities:** Feature detection, excavation, sieving, sorting, analysis, soil sampling, field documentation, ‘dumpy’ operation , Total Station operation, DGPS operation, rock art tracing and photography, engraving tracing and photography.

South African excavations:

Early Stone Age excavation at Maropeng World Heritage Site in Gauteng (1 Week – August 2015)

Pig cadaver exhumation as part of forensic experiment near Pretoria, Gauteng (1 Week – December 2014) - Praised for having the determination of returning for each subsequent excavation day as it was performed on a purely volunteer basis and the work conditions were particularly strenuous - Dr. Coen Nienaber

Iron Age excavation at Komati Gorge, Mpumalanga (1 Week – August 2014) - Praised for being exceptionally “methodical and proficient” with my excavation techniques – Dr. Alex Schoeman

Rock art fieldwork at Komati Gorge, Mpumalanga (1 Week – August 2014)

Underwater archaeology site mapping Komati Gorge, Mpumalanga (1 Week – August 2014)

Early Stone Age excavation at Maropeng World Heritage Site in Gauteng (2 Weeks - September 2013) - Personally uncovered some of the only stone tools (~1.8 million years old) found during that digging season.

**2016: Excavation Supervisor - Responsibilities:** Supervision of two junior excavators, site detection, decision of excavation grid placement, excavation, sieving, sorting, soil sampling, field documentation.

Historical (farm site) excavation at Graaff-Reinet, Eastern Cape, South Africa (2 Weeks) Completed dig 1 week ahead of schedule aided by my efficient direction, drive and support to the excavators under my supervision.

**April 2017 – April 2018:** Intern Archaeologist – PGS Heritage: Heritage Impact assessments, background research, report writing, permit applications, collections management, stakeholder engagement and grave relocation.

**April 2018 – PRESENT:** Archaeologist – PGS Heritage: Heritage Impact assessments, background research, report writing, permit applications, collections management, stakeholder engagement and grave relocation.

### **Professional Body Membership:**

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

CRM Accreditation (ASAPA) -

Field Supervisor – Stone Age, Iron Age & Grave Relocations



## **MARKO HUTTEN**

### **Professional Archaeologist**

Name: Marko Hutten  
Profession: Archaeologist  
Date of birth: 1971-06-24  
Parent Firm: PGS Heritage Pty Ltd  
Position at Firm: Freelance Archaeologist  
Years with firm: 9  
Years of experience: 20  
Nationality: South African  
HDI Status: White Male

### **EDUCATION:**

Name of University or Institution : University of Pretoria  
Degree obtained : BA  
Major subjects : Archaeology & Anthropology  
Year : 1996

Name of University or Institution : University of Pretoria  
Degree obtained : BA [Hons]  
Major subjects : Archaeology  
Year : 1997

### **Professional Qualifications:**

Professional Archaeologist - Association of Southern African Professional

Archaeologists - Professional Member CRM Accreditation:

- Field Director - Iron Age
- Field Director - Grave Relocation

### **Languages:**

Afrikaans – First language

English – Speaking (Good) Reading (Good), Writing (Good)

### **KEY QUALIFICATIONS**

Archaeological mitigation and excavations, Social consultation on grave relocation projects, Cultural Resource Management and Heritage Impact Assessment

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**CLIENT NAME:** G7 Renewables (PTY) LTD

**prepared by:** PGS for SIVEST

**Project Description:** Tooverberg WEF

**Revision No.** 0

14 December 2018



Management, Historical and Archival Research, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management.

## **EXPERIENCE**

### **Archaeological Impact Assessments**

1998 – 2016

Performed 300+ Archaeological Impact Assessments (1st phase). Clients include:

- Vodacom
- Telkom
- Eskom
- Roads Agency of Limpopo (RAL)
- Department of Water Affairs and Forestry (DWAF)
- South African National Parks (SANParks)
- Impala Platinum
- Various Environmental Impact Assessment Companies such as: Naledzi Environmental Consultants; Tekplan Environmental; Lokisa Environmental Consulting

### **Grave Relocation Projects:**

- Nandoni Dam Grave Relocation Project, ± 1000 graves, 2000/01 (Field Director)
- Tavistock Colliery Grave Relocation Project, ± 700 graves, 2002 (Field Director)
- Marula Platinum Grave Rescue Project, x 2 graves, 2003 (Field Director)
- Silverlakes Grave Relocation Project, x 5 graves, 2005 (Field Director)
- Bela-Bela (Outpost) Grave Relocation Project, x 80 graves, 2008 (Field Director)
- Potgieters Rus Platinum Mine Grave Relocation Project, x 16 graves, 2008 (Field Director)
- New Vaal Colliery Grave Relocation Project, x 1700 graves, 2007 (Field Director)
- Shakadza Road Upgrade Grave Rescue Project, x 1 grave, 2007 (Field Director)

- Mapungubwe Grave Repatriation Project 2007 (Field Supervisor)
- Atcom Colliery Grave Relocation project, x200 graves 2008-2009 (Field Director)
- Nkomati Mine Grave Relocation project, 100 graves 2009-2010 (Field Director)
- Tweefontein Optimization Grave Relocation Project, 800 graves. 2014-current (Field Director)

**Second Phase Investigations/Excavations** (*Including Site Stabilization and Rehabilitation*):

- Nandoni Dam Archaeological Project 1998 (Field Supervisor)
- Nandoni Dam Archaeological Project 1998 – 1999 (Field Director)
- Mapungubwe Rehabilitation Project 2003 (Field Director)
- Schroda Rehabilitation Project 2006 (Field Director)
- K2 Rehabilitation Project 2006 (Field Director)
- Mapungubwe Rehabilitation Project 2006 (Field Director)
- Shakadza Rescue and Rehabilitation Project 2007 (Field Director)
- Clanwilliam Dam Mitigation Project, 2014-current – Site Manager

**2008-2013**

**Archaeological Impact Assessments (1st phase)** (*Projects in conjunction with, in brackets*):

- Premier Mine Heritage Survey 2008 (PGS)
- Gope Transmission Line Survey 2008 (Botswana– Archaeology Africa)
- Argent Siding Heritage Survey 2008 (Archaeology Africa)
- Morgenzon Pipe Line Heritage Survey 2008 (Archaeology Africa)
- Klipfontein Heritage Survey 2008 (PGS)
- Spitzkop Mine Heritage Survey 2008 (PGS)
- Elandsfontein Heritage Survey 2008 (PGS)
- Makobe Township Heritage Survey 2008
- Tswinga Township Heritage Survey 2008
- Mankweng Borrow Pits Heritage Survey 2008
- Knapdaar Heritage Survey 2008 (PGS)
- Hotazel Heritage Survey 2008 (PGS)
- Lisbon Township Heritage Survey 2009
- Koert Louw Heritage Survey 2009 (PGS)
- Knapdaar Heritage Survey 2009 (PGS)
- De Wittekrans Heritage Survey 2009 (PGS)

- Ga-Kgapane Township Heritage Survey 2009
- Guernsey Eco-estate Heritage Survey 2009
- De Deur Heritage Survey 2009 (PGS)
- Bultfontein Heritage Survey 2009 (PGS)
- Optimum Mine Heritage Survey 2009
- Gorkum Eco-Estate Heritage Survey 2009
- Planknek Pipe line Heritage Survey 2009
- Regorogile Ext. 9 Heritage Survey 2009
- Haddon Agricultural Heritage Survey 2009
- Jansenpark Residential Development Heritage Survey 2009
- Klein Kariba Residential Development Heritage Survey 2009
- Kangala Mine Heritage Survey 2009 (PGS)
- Hoedspruit Juice Factory Heritage Survey 2009
- Kameelfontein Heritage Survey 2009 (PGS)
- Leolo Township Heritage Survey 2010
- Rietpol Agricultural Development Heritage Survey 2010
- Lwamondo Mining Heritage Survey 2010
- Vanderbijlpark Heritage Survey 2010 (PGS)
- Kongoni Mine Heritage Survey 2010 (PGS)
- Lehating Mine Heritage Survey 2010 (PGS)
- Donkerpoort Township Heritage Survey 2010
- Klerksdorp Township Heritage Survey 2010 (PGS)
- Boikarabelo Heritage Survey 2010 (PGS)
- Mountain View Township Heritage Survey 2010
- De Put Township Heritage Survey 2010
- Vygeboomfontein Eco-Estate Heritage Survey 2010
- Vuyani-Neptune Power Line Heritage Survey 2010 (PGS)
- Gamma-Kappa Power Line Heritage Survey 2010 (PGS)
- Olifants River Bridge Heritage Survey 2010
- Bon Accord Mine Heritage Survey 2010 (PGS)
- Olifants River Water Scheme Heritage Survey 2010 (PGS)
- Buffelskloof Mine Heritage Survey 2010 (Gem-Science)
- Vlakvarkfontein Mine Heritage Survey 2010 (Gem-Science)
- Spitskop Solar Park Heritage Survey 2011
- Geluksfontein farm Heritage Survey 2011
- Leeuwvallei Town Development Heritage Survey 2011

- De Aar Solar Park Heritage Survey 2011 (PGS)
- Onbekend Mine Heritage Survey 2011 (Gem-Science)
- Witkop Solar Park Heritage Survey 2011
- Bel-Bela Solar Park Heritage Survey 2011
- Delta Solar Park Heritage Survey 2011
- Madibeng Pipe Line Heritage Survey 2011 (PGS)
- Soutpan Solar Park Heritage Survey 2011
- Vlakvarkfontein Mine Heritage Survey 2011 (PGS)
- Vuwani & Valdezia Pipe Lines Heritage Survey 2011

#### **Grave Relocation Projects:**

- Zondagsvlei Grave Relocation Project, x 110 graves, 2008 (PGS: Field Director)
- Garstfontein Road Grave Relocation Project, x 15 graves, 2008 (PGS: Field Director)
- Gautrain Grave Relocation Project, x 40 graves, 2008 (PGS: Field Director)
- Zwavelpoort Grave Relocation Project, x 45 graves, 2009 (PGS: Field Director)
- Motaganeng Grave Relocation Project, x 60 graves, 2009 (PGS: Field Director)
- Smokey Hills Platinum Mine Grave Relocation Project, x 10 graves, 2009 (PGS: Field Director)
- Klein Kopje Colliery Grave Relocation Project, x 4 graves, 2009 (PGS: Field Director)
- Lefapa Grave Relocation Project, x 8 graves, 2009 (PGS: Field Director)
- New Clydesdale Colliery Grave Relocation Project, x 7 graves, 2010 (PGS: Field Director)
- Osizwini Grave Relocation Project, x 73 graves, 2010 (PGS: Field Director)
- Straffontein (New Largo Colliery) Grave Relocation Project, x 16 graves, 2010 (PGS: Field Director)
- ATCOM Colliery Grave Relocation Project, x 80 graves, 2010 (PGS: Field Director)
- Welgelegen Mine Grave Relocation Project, x 7 graves, 2010 (PGS: Field Director)
- Ferreiras (Mashala) Grave Relocation Project, x 11 graves, 2011 (PGS: Field Director)

#### **Second Phase Investigations/Excavations:**

- Onverwacht Archaeological Project 2008 (Archaeology Africa: Field Supervisor)

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14 December 2018

- Nandoni Dam Archaeological Project 1998 (Field Supervisor)
- Nandoni Dam Archaeological Project 1998 – 1999 (Field Director)
- Mapungubwe Rehabilitation Project 2003 (Field Director)
- Schroda Rehabilitation Project 2006 (Field Director)
- K2 Rehabilitation Project 2006 (Field Director)
- Mapungubwe Rehabilitation Project 2006 (Field Director)
- Shakadza Rescue and Rehabilitation Project 2007 (Field Director)
- Clanwilliam Dam Mitigation Project, 2014-current – Site Manager

## **EMPLOYMENT SUMMARY**

2014/09/01 – Current

Hutten Heritage Consultants: Director/Archaeologist

2013/08/01 – Current

PGS Heritage: Archaeologist

2008 - 2013

Hutten Heritage Consultants: Director/Archaeologist

1998 – 2008

Archaeo-Info Northern Province, (AINP): Director/Archaeologist

1995 – 1997

University of Pretoria (Dept. of Anatomy): Technical Assistant

## **Countries of work experience:**

- South Africa
- Botswana

Mozambique

## **Trent Seiler CV**

## Field Technician at PGS

NAME: Trent Seiler

BIRTH DATE: 1991-11-19

IDENTIFICATION NUMBER: 911119 513 6086

DRIVERS LICENSE: Code 08

TRANSPORT: Own Transport

SEX: Male

MARITAL STATUS: Single

NATIONALITY: South African

HOME LANGUAGES: English (speak, read and write)

OTHER LANGUAGES: Afrikaans (speak)

### **Contact Details**

- Cell Phone 079 953 8565
- E-Mail seilertrent@gmail.com

### **Vocational Skills**

Computer training:

- Word, Excel, PowerPoint, Outlook, Publisher, Access, Inkscape, basic GIS and QGIS.

Researching and report compiling

- Compiled research reports continuously throughout tertiary education.

Event Management

- The management of staff, distribution of refreshments as well as stock take.

### **Education**

- University of Pretoria BA general 2010 - 2012
- University of Pretoria Honours Archaeology 2013 – 2014
- University of Pretoria Masters in Archaeology 2015 - 2017

-Honours project- Forager/Farmer relations at the Shashe-Limpopo River Confluence Area, with Special Regard to Schroda

-Masters project- An Archaeological Landscape Study of Forager, Farmer interactions in the Matloutse Limpopo Confluence Area, South Africa.

---

**CLIENT NAME:** G7 Renewables (PTY) LTD

**prepared by:** PGS for SIVEST

**Project Description:** Tooverberg WEF

**Revision No.** 0

14 December 2018

## WOUTER FOURIE

### Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

#### Summary of Experience

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave “rescue” excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
- Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
- Involvement with various Heritage Impact Assessments, outside South Africa, including -
  - Archaeological Studies in Democratic Republic of Congo
  - Heritage Impact Assessments in Mozambique, Botswana and DRC
  - Grave Relocation project in DRC

#### Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

Principal Investigator - Grave Relocations

Field Director – Iron Age

Field Supervisor – Colonial Period and Stone Age

Accredited with Amafa KZN

## **Key Work Experience**

2003- current - Director – PGS Heritage (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Malawi, Mozambique, Mauritius and the Democratic Republic of the Congo



**Amendment to Palaeontological Impact Study:**

PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY, (WEF) BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE (DEA REF: 14/12/16/3/3/2/1115).

**Comments on the implication of changes in the layout of the Rondekop 325 MW Wind Energy Facility on the Paleontological impacts on this development.**

The following changes are proposed for the development:

- Change in the turbine capacity from between 3MW and 6.5MW to be up to 8MW
- All turbines are still valid
  - slight alignment shifts mainly to turbine 16 [ecology changes]
  - 44 [to avoid the 200m bat and bird buffer surrounding the watercourse].
- Turbine 25 access road to crane pad: minor alignment change as the current alignment was very close to the edge of the ridge and ecologist was concerned about downslope erosion).
- Turbine 27 access road: minor alignment shift to avoid crossing a rocky ridge/outcrop as per the ecology requirement.
- Road between turbine 28 & 29: minor alignment change to avoid rocky outcrop.
- Crane pad 29 & 35: minor alignment change to avoid the rocky outcrops.
- Access road north 1: shifted the alignment slightly away from the drainage line and then crossing it perpendicularly at a single point.
- Access road 2: shifted to only cross the drainage line at one point.
- Construction Camp 1: shift to follow road alignment.

During the site, specific field survey exposed rock layers were visually inspected and no visible evidence of fossiliferous outcrops were found. The proposed development site is underlain by the Adelaide Formation of the Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup) (Figure 1 and 2). According to the **information provided** all changes to the proposed Rondekop WEF layout is **minor alignment changes**. After these amendments to the Rondekop WEF layout, the overall Geology of the proposed layout is still the same. And as such the change in the layout of the proposed development will not have an influence on the Palaeontological Heritage of the proposed development.

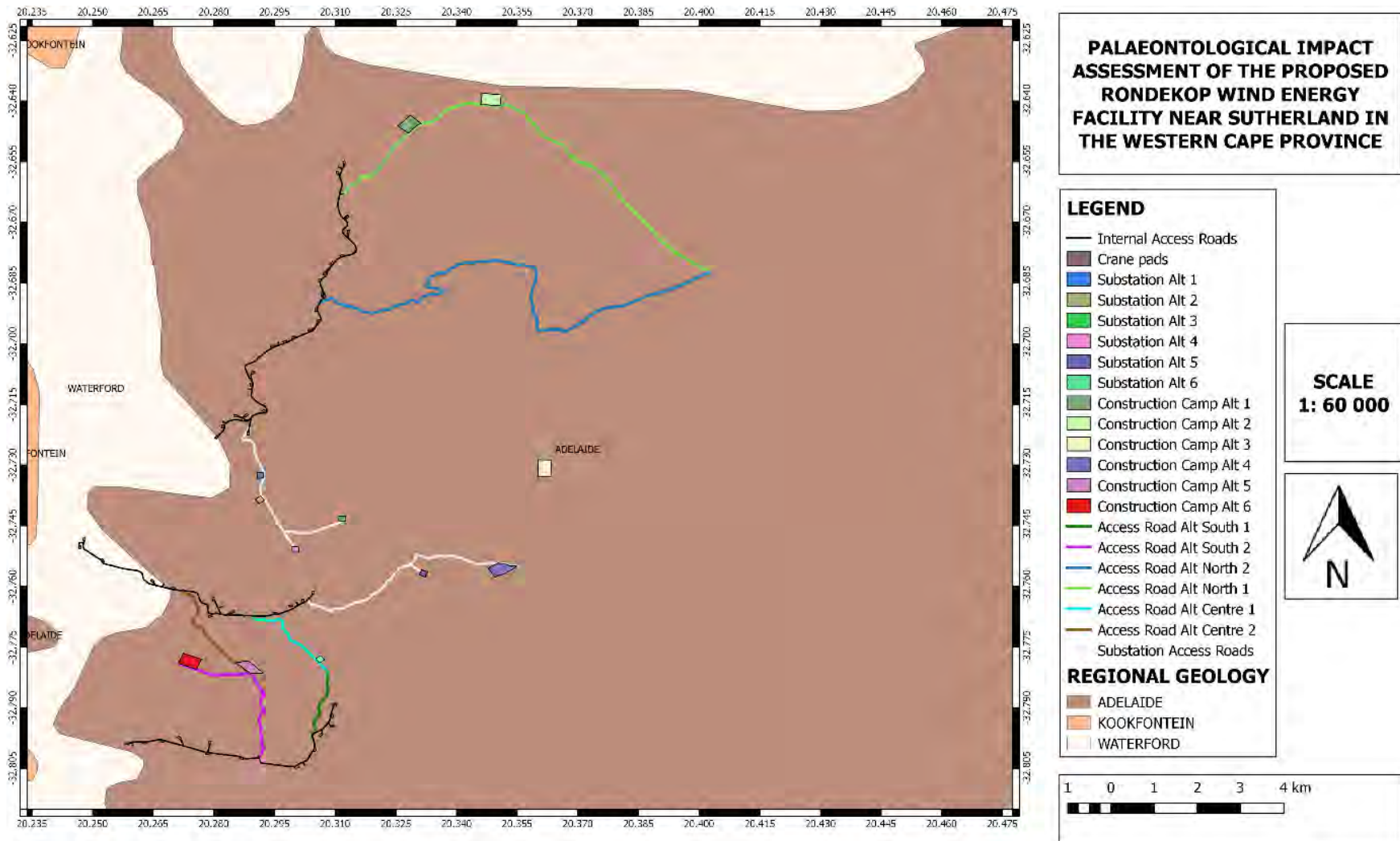


Figure 1: Surface geology of the original Rondekop WEF layout. The proposed development site is underlain by the Adelaide Formation of the Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup). The map was drawn QGIS Desktop 2.18.18.

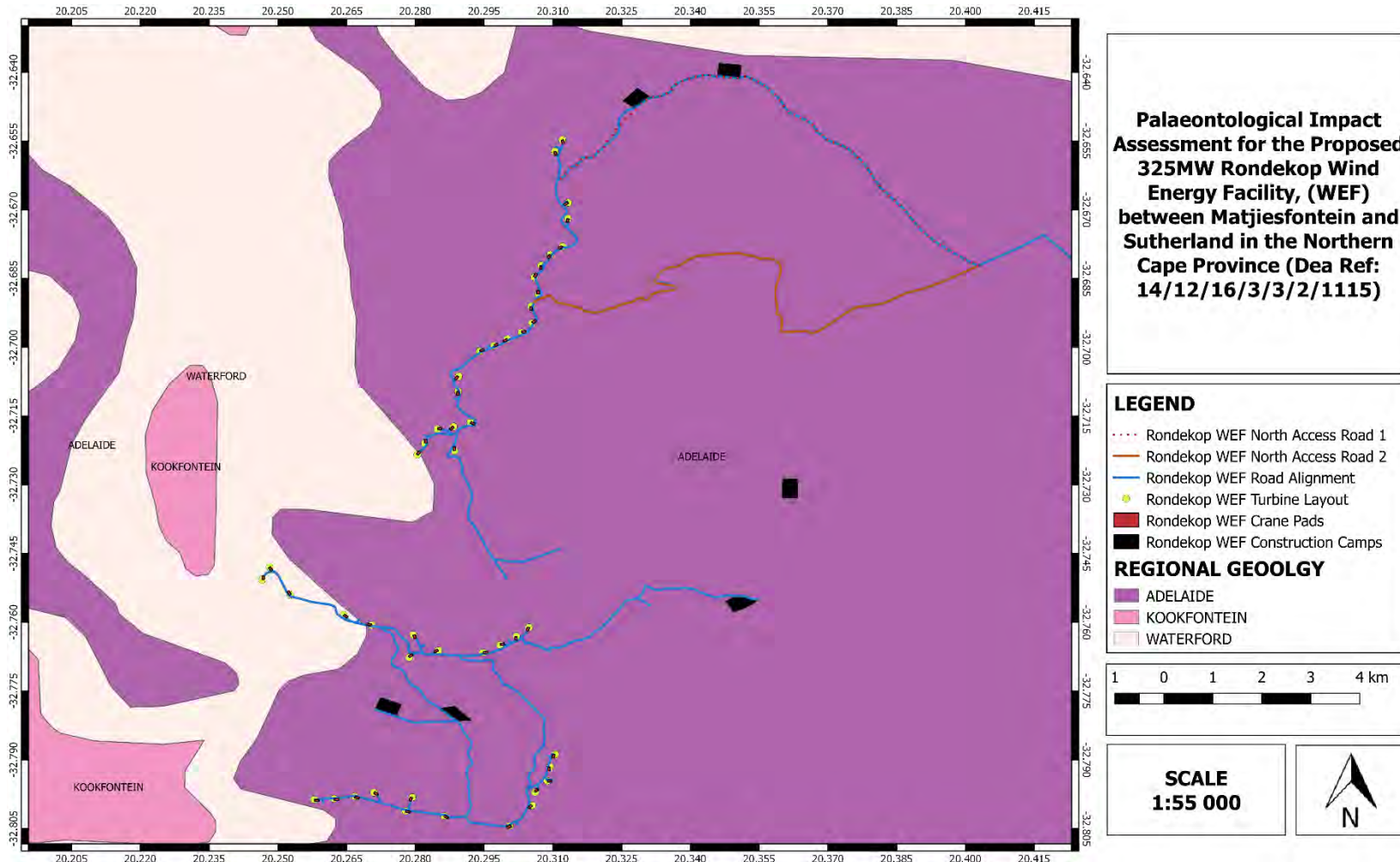


Figure 2. Surface geology of amended Rondekop WEF Layout. The proposed development site is underlain by the Adelaide Formation of the Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup). The map was drawn QGIS Desktop 2.18.18.

The overall impact rating reflected in the report **Palaeontological Impact Assessment** for the proposed 325 MW Rondekop Wind Energy Facility, (WEF) between Matjiesfontein and Sutherland in the Northern Cape Province dated 28 October 2018 **is thus not affected** by the layout changes

Yours sincerely

A handwritten signature in black ink, appearing to read "Elize Butler". The signature is written in a cursive style with a large initial "E".

Elize Butler



# PGS HERITAGE

**ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED 325 MW  
RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND  
SUTHERLAND, IN THE NORTHERN CAPE PROVINCE**

## **PALAEONTOLOGICAL IMPACT ASSESSMENT**

Developer – Rondekop WEF (Pty) Ltd,

Client - G7 Renewable Energies (Pty) Ltd.

EAP -Consultant – SiVEST SA (PTY) LTD, PO Box, Rivonia, 2126.

**Issue Date:** 29 October 2018

**Revision No.:** v0.2

**Client:** SiVEST

**PGS Project No:** 15260 HIA



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## **Declaration of Independence**

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological 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 palaeontological impact assessments, 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 will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

## **Disclosure of Vested Interest**

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

**PALAEONTOLOGICAL CONSULTANT:**

Banzai Environmental (Pty) Ltd

**CONTACT PERSON:**

Elize Butler


Tel: +27 844478759

Email: elizebutler002@gmail.com



**SIGNATURE:**

**ACKNOWLEDGEMENT OF RECEIPT**

<b>Report Title</b>	Environmental Impact Assessment (EIA) For the Proposed 325MW Rondekop Wind Energy Facility between Matjiesfontein and Sutherland in the Northern Cape Province		
<b>Control</b>	<b>Name</b>	<b>Signature</b>	<b>Designation</b>
<b>Author</b>	Elize Butler		Palaeontologist
<b>Reviewed</b>	Wouter Fourie		Archaeologist/ PGS Heritage
<b>Client</b>	Rondekop Wind Farm (Pty) Ltd		Applicant

**CLIENT:**

**SiVEST**

**CONTACT PERSON:**

**Andrea Gibb/Shivani Naidoo**

**SIGNATURE:**

\_\_\_\_\_

The heritage impact assessment report has been compiled taking into account the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

NEMA Regs (2014) - Appendix 6	Relevant section in report
1. (1) A specialist report prepared in terms of these 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;	Page ii of Report – Contact details and company and Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iii – refer to <b>Appendix 2</b>
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2 – Objective
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5 – Geological and Palaeontological history
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8 – Site Visit. No existing impacts
d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 8 – Site Visit
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 7 Approach and Methodology
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;	Section 1.1 Project description and Section 11.5 – Comparative Assessment of Alternatives
g) an identification of any areas to be avoided, including buffers;	No sensitive areas identified
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;	No sensitive areas identified
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Section 11 – Impact Assessment and Section 11.4 – Comparative Assessment of alternative
k) any mitigation measures for inclusion in the EMPr;	N/A as no sensitivities were found on site
l) any conditions for inclusion in the environmental authorisation;	N/A as no sensitivities were found on site
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
n) a reasoned opinion- i. as to whether the proposed activity, activities or portions thereof should be authorised; (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	Section 12 – Conclusion



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;	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
q) any other information requested by the competent authority.	Not applicable.
2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Refer to section 4 compliance with SAHRA guidelines

## EXECUTIVE SUMMARY

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Impact Assessment (PIA) for the proposed Rondekop Wind Energy Facility (WEF) near Sutherland in the Northern Cape Province. According to the National Heritage Resources Act (NHRA) (No 25 of 1999, section 38), a PIA is key to discover the presence of fossil material within the planned development footprint and it is thus necessary to evaluate the impact of the construction on the palaeontological resources.

The proposed Rondekop development site is underlain by the Abrahamskraal Formation (Adelaide Subgroup, lower Beaufort Group, of the Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup). According to the PalaeoMap on SAHRIS the *Abrahamskraal* and *Waterford* Formations have very high Palaeontological sensitivities while the Ecca has a moderate Palaeontological Sensitivity (Almond and Pether 2008, SAHRIS website).

A site specific field survey of the development footprint were conducted on foot and by motor vehicle from the 1<sup>st</sup> - 3<sup>rd</sup> October 2018. Access to all of the locations of the proposed site proved to be difficult. However, as many as possible of the proposed infrastructure locations were investigated. Exposed rock layers were visually inspected but there were no visible evidence of fossiliferous outcrops. For this reason, an overall **low palaeontological sensitivity** is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Rondekop WEF development will be of a **low significance** in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the **construction of the development may be authorised in its whole extent**, as the development footprint is not considered sensitive in terms of palaeontological resources.

**The proposed development, as well as all alternatives have a similar geology and therefore there is no preferences on the grounds of palaeontological fossil heritage for any specific layout among the different options under consideration.** The different options include the on-site substation, construction yards, the access roads to the ridges and turbine layouts along with proposed associated infrastructure. As impacts on fossil heritage usually only occur during the excavation phase and no further impacts on fossil heritage are expected during the operation and decommissioning phases of the WEF.

It is important to note that: “SiVEST under took every effort to obtain the information (including specialist studies, BA/EIA/Scoping and EMPr Reports) for the surrounding developments, however many of the documents are not currently publically available to download. The information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment”.

During the construction phase the deeper bedrock excavations (that is deeper than 1 m) should be monitored by the Environmental Control Officer (ECO) for fossil heritage. In the event that fossil remains are uncovered during any phase of construction, operation and decommissioning, either on the surface or unearthed by new excavations and vegetation clearance, the (ECO) in charge of these developments ought to be alerted immediately and the chance find protocol must be followed. These discoveries ought to be protected (if possible *in situ*) and the ECO must report to SAHRA (SAHRA for the Northern Cape (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)) so that correct mitigation (e.g. recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies proposed by SAHRA.

### Impact Summary

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-14	(negative low)	-12	(negative low)
Cumulative impact	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-16	Negative low Impact	-14	Negative low Impact
Impact associated with the no-go alternative	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	Neutral	Neutral	Neutral	Neutral

It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

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## TERMINOLOGY AND ABBREVIATIONS

### Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

### Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

### Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

### Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 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).

## **Heritage resources**

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

## **Holocene**

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

## **Late Stone Age**

The archaeology of the last 30 000 years associated with fully modern people.

## **Late Iron Age (Early Farming Communities)**

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

## **Middle Stone Age**

The archaeology of the Stone Age between 30 000-300 000 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.



Table 1: Abbreviations

<b>Abbreviations</b>	<b>Description</b>
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
ECO	Environmental Control Officer
EA	Environmental Authorization
EIA	Environmental Impact Assessment
ESA	Early Stone Age
FM	Formation
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PIA	Palaeontological Impact Assessment
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
REDZ	Renewable Energy Development Zone
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SEF	Solar Energy Farm
WEF	Wind Energy Facility

## 1 INTRODUCTION

Rondekop Wind Farm (Pty) Ltd plan to develop a 325MW Wind Energy Facility between Maitjiesfontein and Sutherland in the Northern Cape. The proposed development is situated approximately 45 km south-west of Sutherland in the Northern Cape Province (Namakwa District Municipality, Karoo Hoogland Local Municipality) (**Figure 1-3**). The proposed Rondekop Wind Energy Facility (WEF) is partially located within the Komsberg Renewable Energy Development Zone (REDZ 2) (**Figure 4**). This is one of the eight REDZ officially gazetted<sup>1</sup> in South Africa stipulating the procedure in applying for environmental authorization (EA) for large scale solar and wind energy generation facilities. Given that the planned facility is not entirely situated within the Komsberg REDZ, the Rondekop WEF will be focus to a full Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) as amended and EIA Regulations, 2014 (as amended).

PGS Heritage was commissioned by SiVEST SA (Pty) Ltd on behalf of Rondekop Wind Farm to conduct the Heritage impact Assessment. Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Impact Assessment (PIA). According to the National Heritage Resources Act (NHRA) (No 25 of 1999, section 38), a PIA is key to detect the presence of fossil material within the proposed development footprint and it is thus necessary to evaluate the impact of the construction on the palaeontological resources. This Palaeontological Impact Assessment report serves to fulfil the requirement and form part of the EIA.

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<sup>1</sup> **Formally gazetted on 16 February 2018 (Government notice 114)**

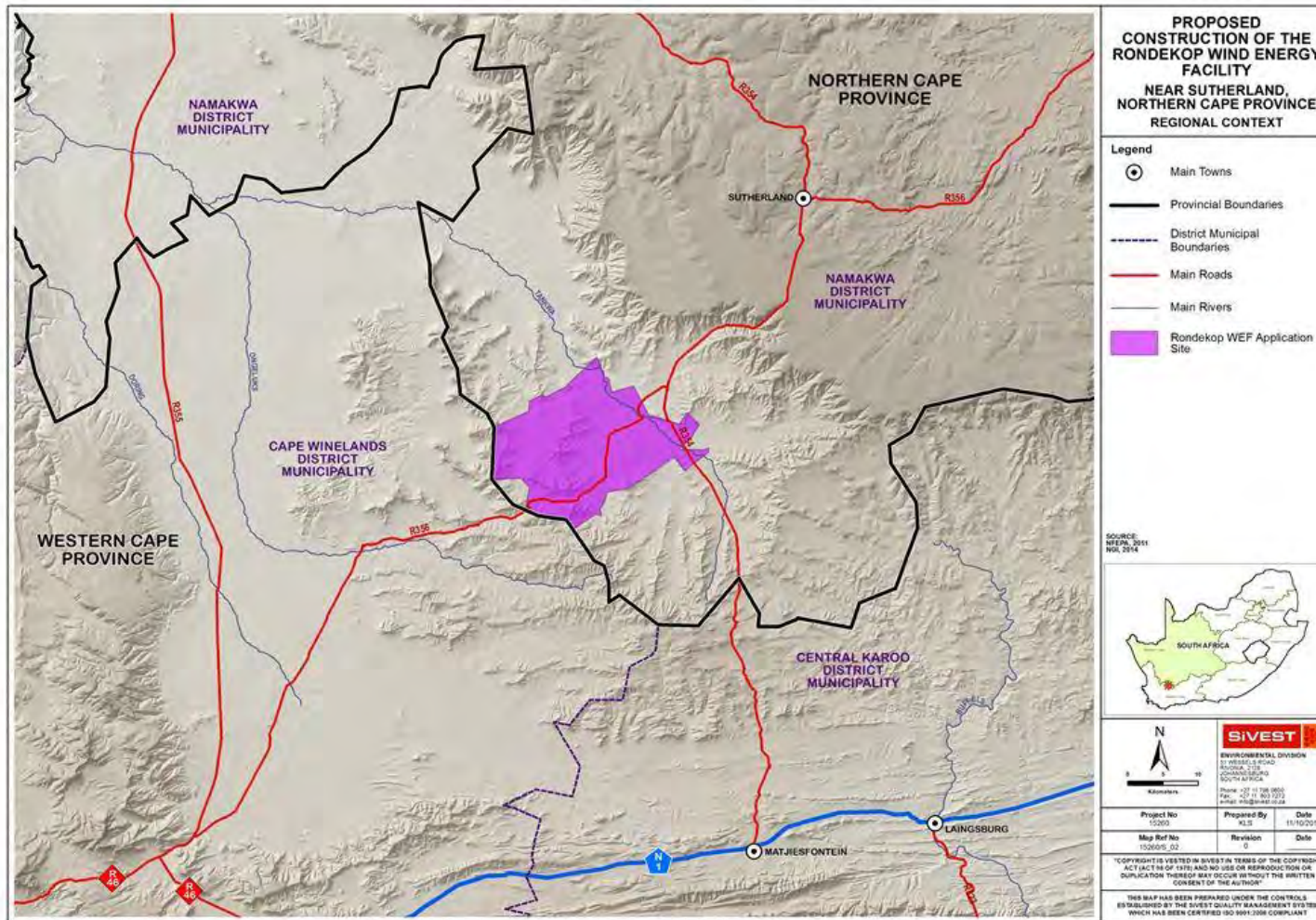


Figure 1: Rondekop WEF locality map. Map provided by SIVEST.

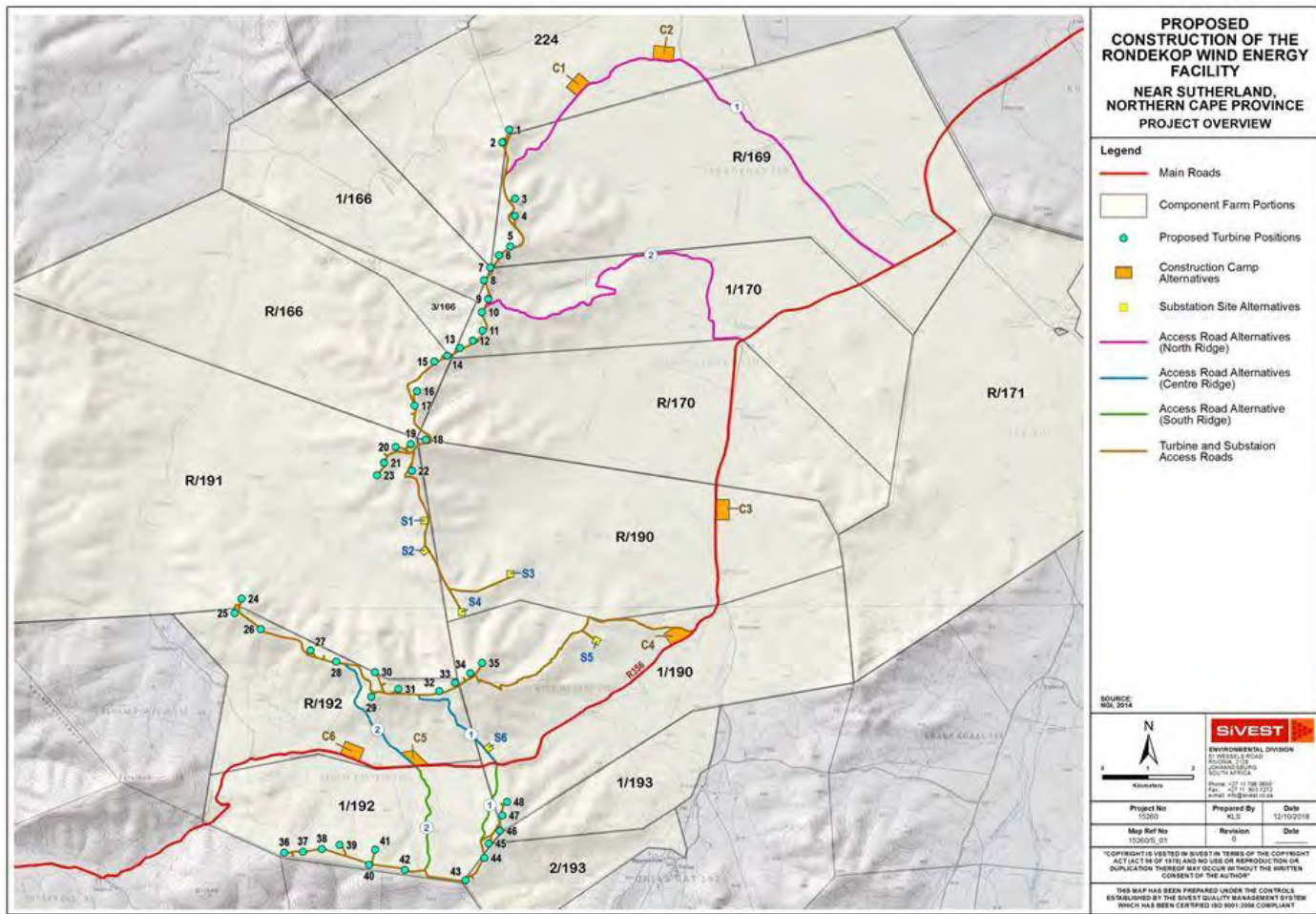


Figure 2: Overview of the Rondekop WEF. Map provided by SiVEST.

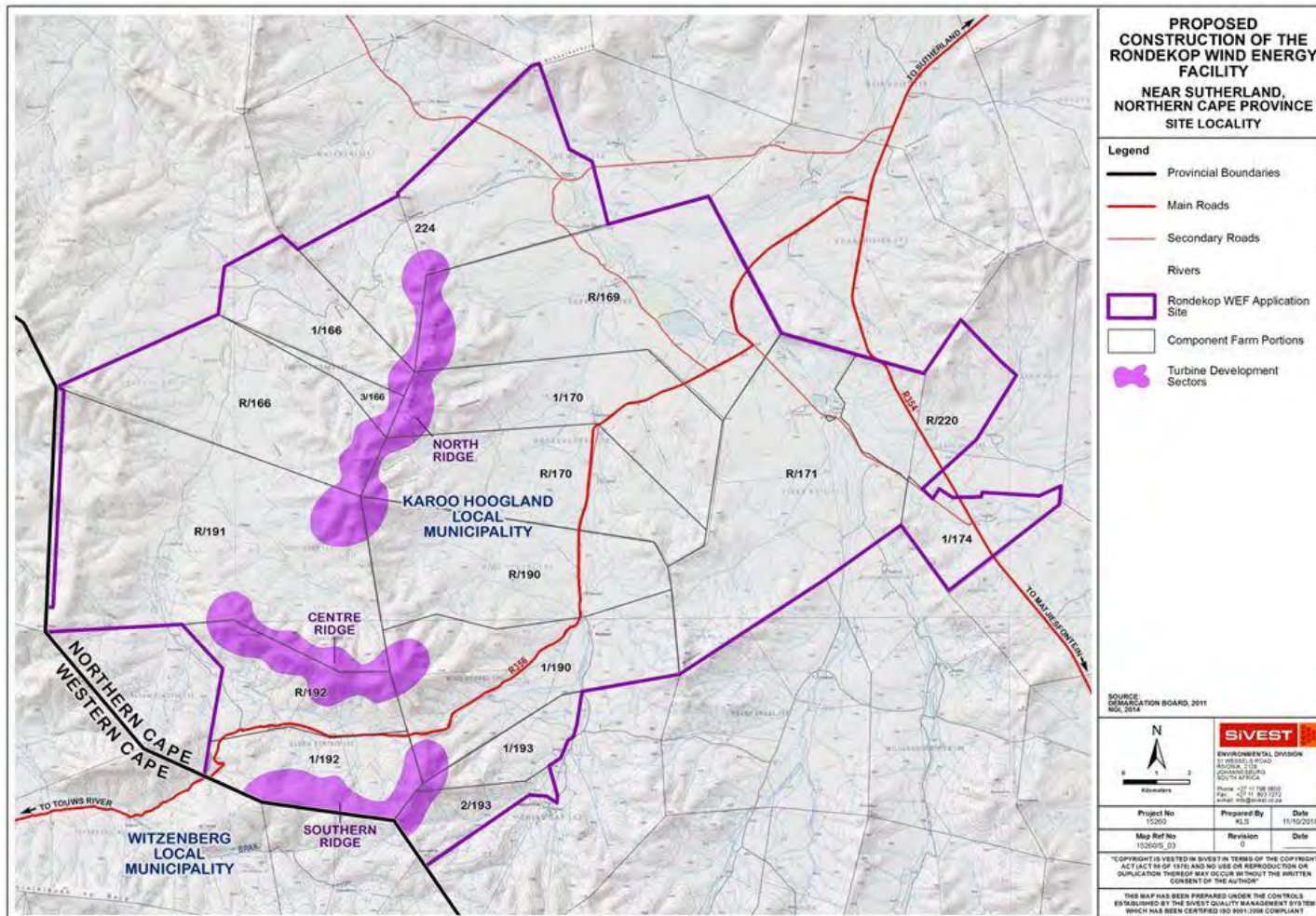


Figure 3: Overview of the Rondekop WEF site layout. Map provided by SiVEST.

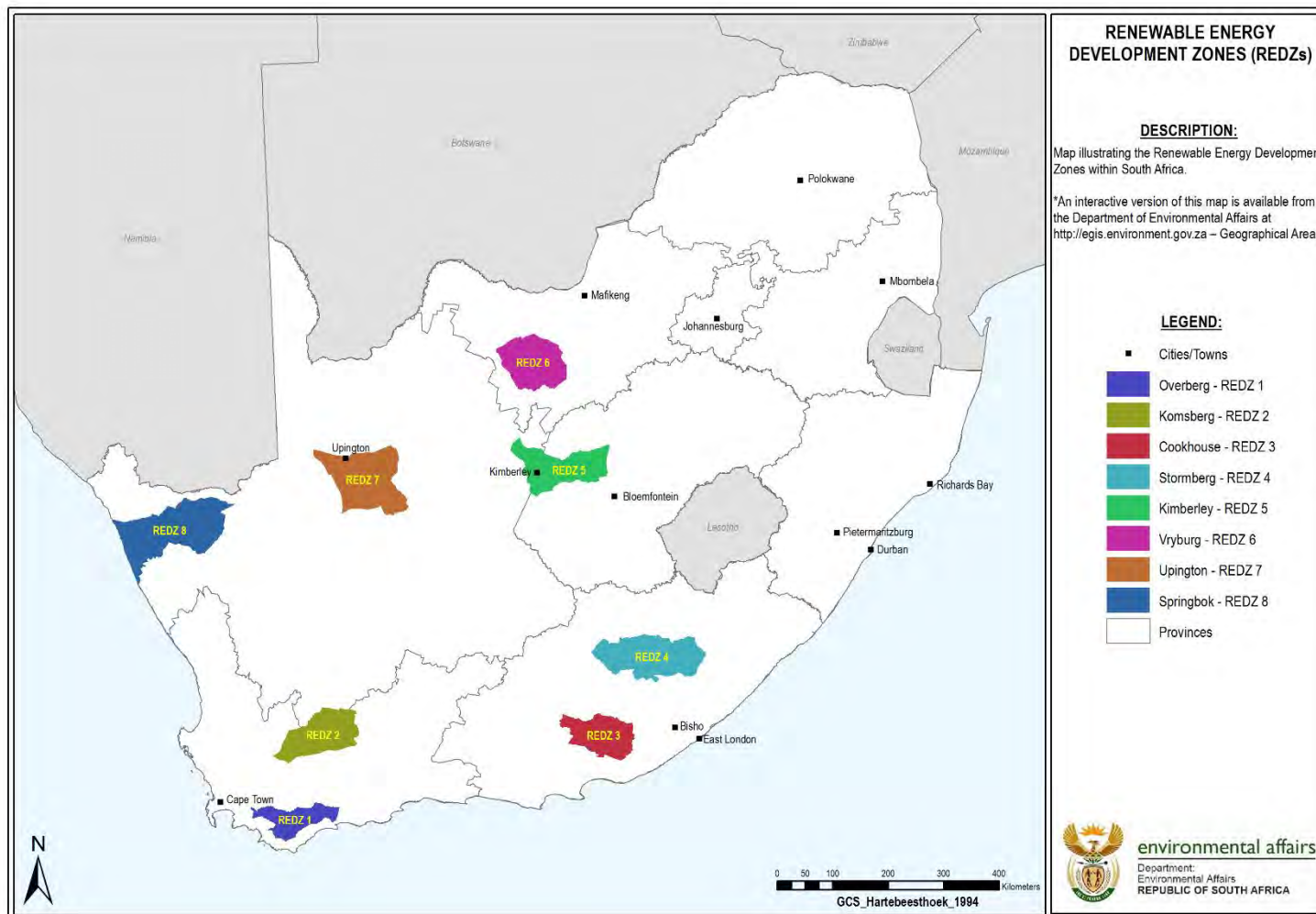


Figure 4. Renewable Energy Development Zones (REDs).

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## 1.1 Project Description

Rondekop Wind Farm (Pty) Ltd propose to develop a Wind Energy Facility (WEF) of up to 325 megawatt (MW), 45 km south-west of Sutherland, in the Northern Cape Province, South Africa. The proposed facility is located within the Karoo Hoogland Local Municipality, which fall within the Namakwa District Municipalities.

The Rondekop WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 48 wind turbines, each between 3MW and 6.5MW in nameplate capacity each with a foundation of up to 30 m in diameter and up to 5 m in depth.
- The hub height of each turbine will be between 90 m and up to 140 m and its rotor diameter between 100 m and up to 180 m.
- Permanent compacted hard-standing laydown areas (also known as crane pads) for each wind turbine of 90 m x 50 m (total footprint 21.6ha) during construction and for ongoing maintenance purposes for the lifetime of the project.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2 m x 2 m, but can be up to 10 m x 10 m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12 m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 73 ha. 38,6 ha will be upgrades to existing roads.. Turns will have a radius of up to 50 m in order for abnormal loads (especially turbine blades) to access the various turbine positions.
- Access roads to the site will be approximately 9 m wide while access roads to the substation will be approximately 6 m wide.
- One 33/132kV onsite substation. The 33kV footprint will need to be assessed as part of the WEF EIA and the 132kV footprint will be assessed in a separate EIA process as the current applicant will remain in control of the low voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.
- Up to 4 (the height will be the same as the final wind turbine hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~13ha) which includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.

- Fencing will be limited around the construction camp and batching plant. The entire facility would not be fenced off. The height of fences around the construction camp are anticipated to be up to 6 m.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the DWS will be applied for separately.
- Application site ~37 543.13 hectares (cadastral units). The total footprint of the wind farm will however be ~ 114 ha (of which ~38ha will be upgrading of existing roads).

### **Turbine Layout Alternatives**

One layout alternative will be assessed for Rondekop WEF based on 48 wind turbines with associated crane pad areas and other associated infrastructure. The proposed layout is spread over three (3) ridges namely northern ridge, centre ridge and southern ridge. The proposed layout will be amended, as needed, based on specialist input and input from I&APs.

### **Road layout alternatives**

Various access road alternatives are currently proposed to connect the public R356 to the three ridges. The proposed access to the site is from the tarred R354 connecting Matjiesfontein and Sutherland, turning north-west onto R356 provincial gravel road and heading west from where the access roads branches off. The six (6) access road alternatives (two (2) per ridge) branch off the public R356.

Considering that the proposed Rondekop WEF is to be developed on three (3) separate ridges, there are two (2) proposed access roads to each ridge, therefore six (6) access road alternatives in total. Three access road alternatives would connect the public R356 road to the new wind farm road network between the turbines on the ridges namely:

#### *North ridge*

- Access road alternative North 1, route is approximately 11.8 km in length, almost all of which comprises an existing farm road that will need to be upgraded; or
- Access road alternative North 2 is approximately 12.8 km in length and branches off the R356 and follows an existing farm road that will need to be upgraded.

#### *Centre ridge*

- Access road alternative Centre 1 is approximately 2.6 km in length and branches off the R356 to the north and connects between turbine 31 and 32; or
- Access road alternative Centre 2 is approximately 3.1 km in length and branches off the R356 and connects to the site near turbine 28.

#### *Southern ridge*



- Access road alternative South 1 is approximately 1.9 km in length and branches off the R356 to the south and connects near turbine 45; or
- Access road alternative South 2 is approximately 4.2 km in length and branches off the R356 to the south and connects near turbine 42.

Each road section will be buffered by approximately 200 m to allow for incremental alternatives i.e. reroute within the buffer in order to avoid any sensitive features identified during the detailed specialist assessments.

### **Construction camps**

Six (6) alternative construction camp layouts, including the area required for a batching plant, will be assessed namely construction camp:

- Construction Camp Alternative 1 is located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction camp Alternative 2 is also located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction Camp Alternative 3 is located adjacent to and east of the R356 public road on the Remainder of farm 190 Wind Heuvel;
- Construction Camp Alternative 4 is located at the intersection of an existing 4x4 track and the R356 on portion 1 of farm 190 Wind Heuvel;
- Construction Camp Alternative 5, is located at the intersection of the R356, access road alternative centre 2 and access road alternative south 1 extending to the north on the remainder of farm 192 Bloem Fontein; and
- Construction Camp Alternative 6 is located to the west of access road alternative centre 2 north of the R356 on the remainder of farm 192 Bloem Fontein.

### **Substations**

Six (6) onsite 33/132kV substation location alternatives were identified based on technical studies which considered aspects such as topography, earth works and levelling, environmentally sensitive features, electrical losses, turbine locations and existing agricultural use. All six (6) positions are located relatively in the centre of the facility.

- Substation alternative 1 is located south of turbine 22 on the remainder of farm 191 Hout Hoek;
- Substation alternative 2 is located south of substation alternative 1 on the remainder of farm 191 Hout Hoek;
- Substation alternative 3 is located south east of substation alternative 2 on the remainder of farm 190 Wind Heuvel;
- Substation alternative 4 is located north east of substation alternative 3 on the remainder of farm 190 Wind Heuvel;

- Substation alternative 5 is located west of construction camp alternative 4 along an existing 4x4 jeep track; and
- Substation alternative 6 is located adjacent to access road alternative center 1 to the east on portion 1 of farm 190 Wind Heuvel.

### **No-Go Alternative**

It is mandatory to consider the “no-go” option in the EIA process. The no development alternative option assumes the site remains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area and the status quo would proceed

## **2 OBJECTIVE**

The terms of reference of a Palaeontological Impact Assessment are as follows:

### **General Requirements:**

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements;
- Provide a thorough overview of all applicable legislation, guidelines;
- Cumulative impact identification and assessment as a result of other renewable energy (RE) developments in the area (including; a cumulative environmental impact table(s) and statement, review of the specialist reports undertaken for other Renewable Energy developments and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered);
- Identification sensitive areas to be avoided (including providing shapefiles/kmls);
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
  - Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
  - Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
  - Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective

impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

- Comparative assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures in order to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (e.g. permits, licenses etc).

#### **Specific Requirements:**

- Describe and map the palaeontological heritage features of the site and surrounding area. This is to be based on desk-top reviews, fieldwork, available databases, findings from other palaeontological heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded.
- Assess the impacts and provide mitigation measures to include in the environmental management plan.
- Map palaeontological heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e. “very high” sensitivity) and provide recommended buffers or set-back distances.
- Identify and assess potential impacts from the project on palaeontology, as required by heritage legislation (including cumulative impacts from other wind farms within a radius of 50 km).
- Provide an updated sensitivity map for the Rondekop WEF project site.
- Assess the project alternatives provided, including the no-go alternative

### **3 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR**

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 12 years. She has been conducting PIAs since 2014. A CV has been attached as Appendix 1 to this report.

### **4 LEGISLATION**

#### **4.1 National Heritage Resources Act (25 of 1999)**

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact Assessment forms part of the Heritage Impact Assessment (HIA) and adheres to the conditions of the NHRA. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- (b) the construction of a bridge or similar structure exceeding 50 m in length;
- (c) any development or other activity which will change the character of a site—
  - i. exceeding 5 000 m<sup>2</sup> in extent; or
  - ii. involving three or more existing erven or subdivisions thereof; or
  - iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  - iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- (d) the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent;
- (e) or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

## 5 GEOLOGICAL AND PALAEOLOGICAL HISTORY

The proposed development site is underlain by the Abrahamskraal Formation, Adelaide Subgroup, of the lower Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup) (**Figure. 5 & 6**). The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. The Beaufort Group of the Karoo Basin consists of a lower Adelaide Subgroup and an upper Tarkastad Subgroup. This group is the focus of palaeontological research in South Africa and are internationally renowned for the early diversification of land vertebrates. The Beaufort Group provide the worlds' most complete transition from early "reptiles" to mammals.

STRATIGRAPHY							
AGE		WEST OF 24°E	EAST OF 24° E	FREE STATE/ KWAZULU- NATAL	SACS RECOGNISED ASSEMBLAGE ZONES	PROPOSED BIOSTRATIGRAPHIC SUBDIVISIONS	
JURASSIC	"STORMBERG"	[Dotted pattern]	Drakensberg F.	Drakensberg F.			
			Clarens F.	Clarens F.		<i>Massospondylus</i>	
TRIASSIC	TARKASTAD SUBGROUP	[Dotted pattern]	Elliot F.	Elliot F.		" <i>Euskelosaurus</i> "	
			MOLTENO F.	MOLTENO F.			
PERMIAN	BEAUFORT GROUP	TARKASTAD SUBGROUP	BURGERSDORP F.	DRIEKOPPEN F.	<i>Cynognathus</i>		
			KATBERG F.	VERKYKERSKOP F.	<i>Lystrosaurus</i>	<i>Procolophon</i>	
			Palingkloof M.	HARRISMITH M.	<i>Daptocephalus</i>		
			Elandsberg M.	SCHOONDRAAI M.			
			Barberskrans M.	ROOINEKKE M.			
			Steenkamps- vlakke M.	DAGGABOERS- NEK M.			
	Oukloof M.	Oudeberg M.	<i>Cistecephalus</i>				
	ADELAIDE SUBGROUP	TEEKLOOF F.	[Dotted pattern]	Hoedemaker M.	MIDDELTON F.	<i>Tropidostoma</i>	
				Poortjie M.		<i>Pristerognathus</i>	
				ABRAHAMSKRAAL F.	KROONAP F.	<i>Tapinocephalus</i>	UPPER UNIT
							LOWER UNIT
						<i>Eodicynodon</i>	
ECCA GROUP	ADELAIDE SUBGROUP	[Dotted pattern]	WATERFORD F.	WATERFORD F.			
			TIERBERG/ FORT BROWN F.	FORT BROWN F.			
			LAINGSBURG/ RIPON F.	RIPON F.	VRYHEID F.		
			COLLINGHAM F.	COLLINGHAM F.	PIETER- MARITZBURG F.		
			WHITEHILL F.	WHITEHILL F.			
			PRINCE ALBERT F.	PRINCE ALBERT F.	MBIZANE F.	<i>'Mesosaurus'</i>	
CARBON- IFEROUS	DWYKA GROUP		ELANDSVLEI F.	ELANDSVLEI F.			

SANDSTONE-RICH UNIT

HIATAL SURFACE

END BEAUFORT GROUP

HIATUS

Figure 5: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions Beaufort Group of the Karoo Supergroup with rock units and fossil assemblage zones relevant to the present study marked in orange (Modified from Rubidge, 1995). Abbreviations: F. = Formation, M. = Member

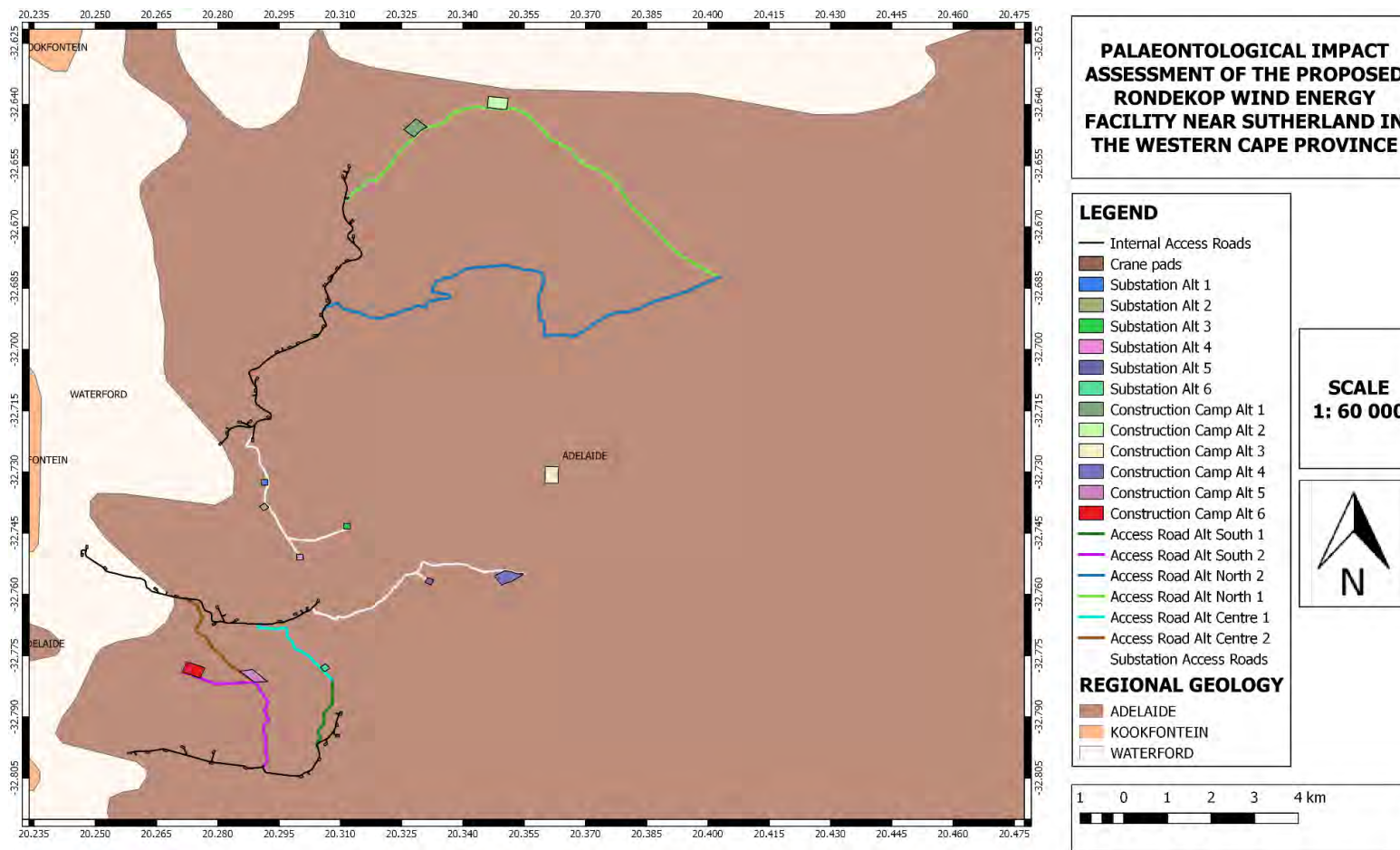


Figure 6: Surface Geology for the proposed Rondekop Wind Energy Facility near Sutherland in the Cape Province. The proposed development site is underlain by the Adelaide Formation of the Beaufort Group (Karoo Supergroup) and the Waterford Formation of the Ecca Group (Karoo Supergroup). Map drawn QGIS Desktop 2.18.18.

## 5.1 Geology

### 5.1.1 Ecca Group

The Ecca group forms part of the Karoo Supergroup and is divided into several Formations.

Table 2: Ecca Group and Formations. (Modified from Johnson et al, 2006).

Period	Super group	Group	Formation West of 24° E	Formation East of 24° E	Formation Free State / KwaZulu Natal
Permian	Karoo Supergroup	Ecca Group	Waterford Formation	Waterford Formation	Volksrust Formation
			Tierberg / Fort Brown Formation	Fort Brown Formation	
			Laingsburg / Rippon Formation	Rippon Formation	Vryheid Formation
			Collingham Formation	Collingham Formation	Pietermaritzburg Formation
			Whitehill Formation	Whitehill Formation	
			Prince Albert Formation	Prince Albert Formation	Mbizane Formation

The proposed Rondekop WEF development site is underlain by the arenaceous Waterford Formation which overlies the Fort Brown Formation (Department of Water Affairs DWA, 1998). The formation comprises alternating very fine-grained, lithofeldspathic sandstone and mudrock or clastic rhythmite units. The Waterford Formation, consists of fine- to medium-grained sandstone, siltstone, shale and rhythmite. The lower part of the Formation is characterized by upward-coarsening cycles of sediments, which are capped by extensive sheet-like sandstones and alternating chaotic, slump and slide deposits. The upper portion of the Formation consists of sandstone (approximately 8 m thick), siltstone, ball-and-pillow layers and channel-fill deposits.

### 5.1.2 Beaufort Group

Table 3: Adelaide Subgroup and Formations. Modified from Modified from Rubidge, 1995)

Period	Supergroup	Group	Subgroup	Formation West of 24° E	Formation East of 24° E
Middle Permian to Middle Triassic	Karoo Supergroup	Beaufort Group	Adelaide Subgroup		Balfour Formation
				Teekloof Formation	Middleton Formation

			Abrahamskraal Formation	Kroonap Formation
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The proposed Rondekop WEF development site is underlain by a series of Karoo sandstones, mudstones and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group. The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000 km<sup>2</sup> in South Africa and is the first fully continental sequence in the Karoo Supergroup, and is divided into the Adelaide subgroup and the overlying Tarkastad subgroup. The Adelaide subgroup rocks are deposited under a humid climate that allowed for the formation of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments.

### Stratigraphy

In the south eastern portion of the Karoo Basin the Adelaide Subgroup consists of the Koonap, Middleton and Balfour Formations. West of 24° the Adelaide Subgroup is represented by the Abrahamskraal and Teekloof Formations and in the north the Group is represented by the Normandien Formation. The Adelaide Subgroup is approximately 5 000 m thick in the southeast, but this decreases to about 800 m in the centre of the basin which thins out to about 100 to 200m in the north. The Kroonap Formation is about 1 300 m, Middleton 1 600 m and the Balfour Formation approximately 200 m thick. The Abrahamskraal Formation is about 2 500 m thick and the Teekloof Formation 1 000 m. The Normandien Formation is only about 320 m thick.

The Lower Adelaide Subgroup consists of the following formations:

- *Kroonap Formation*: Transitional brackish lacustrine to fluvial. Greenish-grey sandstones grading upwards into fine-grained siltstones and mudstones.
- *Abrahamskraal Formation*: Consists of greenish-grey and less commonly of reddish-brown mudrock and subordinate light grey fine-grained sandstone, fining-upward. The 1st to 3rd order cycles range in thickness from a few meters to tens of meters (Cole, 2016). It reaches a maximum thickness in the southwest part of the basin (2200 to 2565 m) and thins northeastward. The sedimentary facies represent deposition on a huge alluvial plain with lateral and downstream accretionary sand bodies in fluvial channels and flood basin and subordinate lacustrine muds and silts in the extensive interchannel areas.
- *Middleton Formation*: Semi-arid climate supported a lush flora and fauna that thrived along meander belts and semi-permanent lakes. Cyclic deposits of lenticular sandstone bodies grading into greenish-grey mudstone. The thickest formation in this succession, constituting



37% of the Beaufort Group and 47% of the Adelaide Subgroup. The formation has lenses of red mudstone which are likely to have been deposited in a sub-aerial fluvial environment.

- *Balfour Formation*: The upper part of the Adelaide Subgroup (lower to middle Beaufort).

### **Composition**

The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish-grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium grained, grey lithofeldspathic sandstones. In the northern Normandien formation the basin consists of coarse to very coarse sandstones and granulstones. Coarsening-upward cycles are present in the lower part of the Normandien Formation while the mudrocks and sandstone units usually form fining-upward cycles. These cycles are positioned on erosion surfaces which is overlain by thin intraformational mud-pellet conglomerate and vary in thickness from a few meters to tens of meters. Singular sandstone units could vary from 6 meters to 60 meters in the south thinning northwards however thick sandstone units are also present in the northern Normandien Formation.

Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and fill features. The sandstones are characterized internally by horizontal lamination together with parting lineation and less frequent trough cross-bedding as well as current ripple lamination. The bases of the sandstone units are massive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units.

The mudrocks of the Adelaide Subgroup usually has massive and blocky weathering apart from in the Normandien and Daggaboersnek Member. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

## **5.2 Palaeontology**

### *5.2.1 Ecca Group*

#### **Waterford Formation**

Fossil remains from this formation usually consists of poorly preserved tetrapod bones that could probably belong to the aquatic temnospondyl amphibians. Scattered fish scales and fish coprolites have been recovered as well as several genera of non-marine bivalves. A low diversity of trace assemblages have been described that may belong to the *Scoyenia ichnofacies*. These trace fossils could possibly have been made by small arthropods, earthworms and even insects. Petrified wood of the Glossopteris flora are commonly found in this formation as well as gymnospermous woods namely, *Prototaxoxylon* and *Australoxylon*.

### 5.2.2 Beaufort Group

The Beaufort Group has been divided into a series of fossil biozones known as fossil assemblage zones (AZ) (**Figure 5**). These AZ are distinguished by their characteristic tetrapod faunas. The Abrahamskraal Formation is represented by the *Eodicynodon*, *Tapinocephalus* and partially by the *Pristerognathus* Assemblage Zones. The AZ present in the proposed Rondekop WEF development is most probably the *Tapinocephalus* Assemblage Zone.

#### **Tapinocephalus Assemblage Zone**

Vertebrate fossils in this assemblage zone is not as abundantly found as in later assemblage zones. Fossils are generally recovered as single specimens and is often covered by brown-weathering calcareous nodular material. Fauna present in this assemblage zone is mostly large bodied dinocephalians and pareiasaurs. Large *Bradysaurus* specimens are found as complete articulated skeletons and in a dorsal-up position while dinocephalian skulls with associated postcrania are extremely uncommon (**Figure 7**). A few isolated carnivore specimens of gorgonopsia (also known as sabre toothed reptiles), biarmosuchians and therocephalians have been recovered while pelycosaurus are uncommon.

The *Tapinocephalus* AZ is also known for large disarticulated amphibians as well as palaeoniscoid bony fish, mostly represented by scattered scales. Gastropods are represented by freshwater bivalves. Fragmentary vascular plant remains include roots, twigs and leaves and petrified wood. Trace fossils are also known from this assemblage zone and include traces of arthropod, tetrapod and worm burrows, tetrapod trackways, fossilized faeces or coprolites and stem and plant casts.

Vertebrate fossils found in the Sutherland area include the tapinocephalid and titanosuchid dinocephalians, the pareiasaur *Bradysaurus*, as well as more uncommon dicynodonts, gorgonopsians and therocephalians. Several examples of plant remains have also been documented from this assemblage zone.

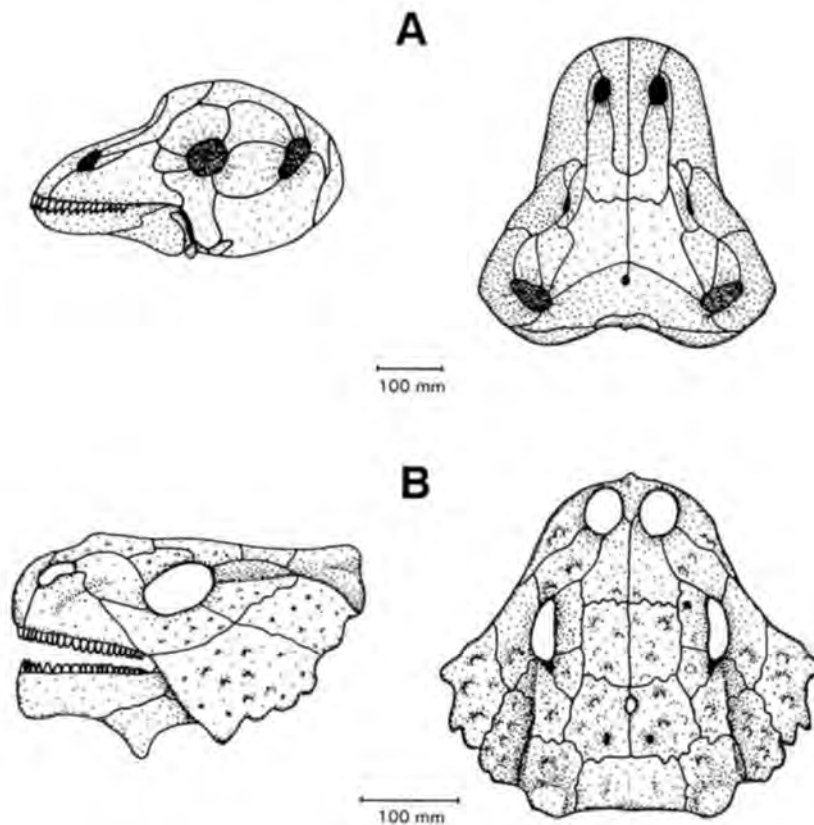


Figure 7: Fossils characteristic of the Tapinocephalus AZ include A) the dinocephalian therapsid Tapinocephalus and B) the pareiasaur Bradysaurus. Figure taken from Smith and Keyser 1995)

## 6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed development site comprises of the following farms and portions of farms:

- Remainder and Portion 1 and 3 of the Farm Venters Kraal 166,
- 224 of the Farm Ashoek,
- the Farm Zeekoegat 169,
- the Remainder and Portion 1 of the Farm Roodeheuvel 170,
- the Remainder and Portion 1 of the Farm Wind Heuvel 190,
- the Remainder of the Farm Hout Hoek 191,
- the Remainder and Portion 1 of the Farm Bloem Fontein 192
- Portions 1 and 3 of the Farm Urias Gat 193,
- Portion 1 of Farm Lange Huis 174,
- Remainder of the Farm Vinkie Kuil, and
- Remainder of Farm 220.

The proposed Rondekop WEF is located between the Klein Roggeveld Mountains to the south and the Roggeveld Mountains and Plateau to the north.

The proposed Rondekop WEF development falls into an agriculture zone. However the proposed development will have to be rezoned as a special zone and thus will be zoned as commercial / industrial.

## **7 APPROACH AND METHODOLOGY**

The objective of a Palaeontological Impact Assessment is to determine the impact of the development on potential palaeontological material at the site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are:

1. to identify the palaeontological importance of the exposed and rocks below the surface in the development footprint
2. to evaluate the palaeontological importance of the formations
3. to determine the impact of the development on fossil heritage; and
4. to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is compiled, the potentially fossiliferous rocks present within the study area are established from 1:250 000 geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock formation is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions. The palaeontological importance of each rock unit is calculated. The probable impact of the proposed development footprint on local fossil heritage is established on

1. the palaeontological importance of the rocks,
2. the type and scale of the development, and
3. quantity of bedrock excavated.

When rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a palaeontologist is required. Based on both the desktop data and field assessment, the impact significance of the planned development is determined with recommendations for further studies or mitigation. In general, destructive impacts on palaeontological heritage only happen during construction. The excavations will change the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation involves the collection and recording of fossils preceding construction or during construction when hypothetically fossiliferous bedrock is uncovered. Importantly, preceding the excavation of any fossil heritage a permit from SAHRA must be obtained and the material will have

to be housed in a permitted institution. When mitigation is applied correctly, a positive impact is possible because our knowledge of local palaeontological heritage may be increased.

## 7.1 SAHRA minimum standards for Palaeontology reports

As per the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” it states that “Although the details of the Phase 1 Minimum Standards discussed below may not apply directly where these are specifically archaeological, these standards can be used as a general guide to what is needed in Phase 1 palaeontological reports”. The compliance of this PIA to these standards is described in below.

Table 4. Compliance with SAHAR minimum standards

Standards	Compliance
<b>A. Title Page</b> with: <ul style="list-style-type: none"> <li>a) A Title that identifies this report. It should give the name and geographical location of the site(s) and/ or project, including property or farm name (and magisterial district) and province;</li> <li>b) Author(s) surname(s) and details, company name and contact details;</li> <li>c) Developer and consultant's name (who commissioned the report), postal address, telephone and fax numbers;</li> <li>d) Date of report (including day and month).</li> </ul>	Yes
<b>B. Executive Summary</b> including: <ul style="list-style-type: none"> <li>a) The purpose of the study;</li> <li>b) A brief summary of the findings;</li> <li>c) The recommendations; and</li> <li>d) Any stakeholders or people responsible for decisions and actions.</li> </ul>	Yes
<b>C. Table of Contents</b> , for reports longer than 10 pages.	Yes
<b>D. Background Information</b> on the Project with: <ul style="list-style-type: none"> <li>a) Whether the report is part of a scoping report/ EIA/ HIA or not;</li> <li>b) Type of development (e.g. low cost housing project, mining);</li> <li>c) Whether re-zoning and/or subdivision of land is involved;</li> <li>d) Developer and consultant and owner and name and contact details;</li> <li>e) Terms of Reference;</li> <li>f) Legislative requirements.</li> </ul>	Yes
<b>E. Background to the Palaeontology History</b> and other relevant heritage components of the area with, <ul style="list-style-type: none"> <li>a) Literature review or archival research sufficient to place the sites located in context;</li> <li>b) Reference to museum or university databases and collections;</li> <li>c) Previous relevant impact assessment reports for the area.</li> </ul>	Section 5.2 N/A Section 11.2
<b>F. Description of the Property or Affected Environment its setting and heritage resources</b> , with: <ul style="list-style-type: none"> <li>a) Details of the area surveyed including:               <ul style="list-style-type: none"> <li>i. Full Location Data for Province, Magisterial District/Local Authority and property (e.g. farm/erf) name and number, etc.;</li> <li>ii. Location Map(s)/ orthophotos of the general area. These must include the map name and number (e.g. 3318DC Bellville). Maps must include at least a 1:50 000 and (if available) also a 1:10 000 (i.e. most detailed possible). Large scale colour satellite photos</li> </ul> </li> </ul>	Figure 1-3 as well as section 6

<p>make a useful addition. Maps should be preferably at least A4 in size.</p> <p>iii. Either the Location Map or the Site Map must have the polygon of the area surveyed marked on it and full geographical co-ordinates for all relevant points and, where applicable, indication of the area to be developed (footprint). The report or map must indicate exactly what area was searched, and if any area was not searched why this was so; and what the probability is of sites being found there.</p> <p>b) Description of the methodology used including:</p> <p>i. How the area was searched (e.g. a three-person team for two days, and whether on foot or not!) and what, if any, sampling techniques were used;</p> <p>ii. What the restrictions to the study were, for example:</p> <ul style="list-style-type: none"> <li>• visibility affected by high grass or bush or vegetation cover, walls or concrete surfaces;</li> <li>• physical or other impediments (e.g. vlei, swamp, steep kloof, mobile dune) to the assessment of the area;</li> </ul> <p>iii. How the data was acquired, and details of research equipment (e.g. GPS).</p>	<p>Section 7 and Section 8</p> <p>Section 7.1 and 8</p>
<p><b>G. Description of Sites</b> identified and mapped with:</p> <p>a) Details of the location of all the sites including:</p> <p>i. Site Map or aerial photograph of the specific area with the location of all sites marked on it. Make it clear how this relates to the Location Map described above (7.1Fii).</p> <p>ii. GPS readings with the model and datum used (WGS 84 is considered the most useful). Please comment on the accuracy. If co-ordinates are read off the 1:50 000 map, please indicate this. Wherever possible the GIS track actually surveyed should be mapped.</p> <p>b) An adequate description of each site including:</p> <p>i. Type of site (e.g. open scatter; shell midden, cave/shelter);</p> <p>ii. Site categories (e.g. Earlier Stone Age, Late Iron Age);</p> <p>iii. Context (detailed description of depositional history and environment); iv. Cultural affinities, approximate age and significant features of the site; v. Estimation or measurement of the extent (maximum dimensions) and orientation of the site(s);</p> <p>iv. Depth and stratification of the site (where shovel test permits have been given or natural exposures available), both in the text and through photographs of sections; vii. Possible sources of information about past environments, such as stalagmites/ stalagmites, flowstone, dassie middens, peat or organic rich deposits and natural bone accumulations; and viii. Photographs and diagrams, of good quality, with a centimetre scale (e.g. for artefacts) or metre scale (e.g. for large scale village plan) and a caption. Include a 'wide angle' photo of the sites.</p> <p>c) Threats or sources of risk and their impact on the heritage resources (e.g. earth moving, traffic of vehicles or humans, erosion).</p> <p>d) If the sites are in KwaZulu-Natal or the Northern Cape please apply to the old Archaeological Data Recording Centres at the Provincial Museums for National Site Numbers (for sites that will be conserved, excavated or collected).</p>	<p>Section 8</p> <p>Section 8</p> <p>Section 11</p> <p>N/A no sites need to be recorded</p>
<p><b>H. Description of the Artefacts, Faunal, Botanical or Other Finds and Features</b> for each site.</p> <p>Record meaningful information and consider supplying:</p> <p>a) Raw material, type, maximum dimensions and relative frequency of and significant attributes of stone tools observed on the surface;</p>	<p>N/A</p>

<ul style="list-style-type: none"> <li>b) Basic description of ceramics, other artefacts and occurrences such as rock art;</li> <li>c) Description of features (e.g. hearths, bedding, walling);</li> <li>d) Basic description of faunal or botanical taxa and estimated frequencies;</li> <li>e) Adequate photographic and graphic representations (with scale in centimetres); and crossreference photographs with a map showing where the objects in the photographs were found;</li> <li>f) Location of repositories at which artefacts, photographs, rock art tracings and field records (from other sites in the area) are kept.</li> </ul>	<p>Section 8</p> <p>Section 8</p>
<p><b>I. Clear Description of Burial Grounds and Graves</b> with:</p> <ul style="list-style-type: none"> <li>a) Clear written and photographic description of any graves;</li> <li>b) Exact or estimated age and affinities of the burials;</li> <li>c) Clear discussion for the client of the legal implications (include reference to both the Act and the regulations for s.363 , and particularly the public participation process, and whether this should be done by the archaeologist or may be better done by a social consultant).</li> </ul>	<p>N/A for Palaeontological assessment</p>
<p><b>J. Field Rating</b> (Recommended grading or field significance) of the site: While grading is actually the responsibility of the heritage resources authorities, all reports should include Field Ratings for the site(s) discussed (proposals for grading), to comply with section 38 of the national legislation, for example:</p> <ul style="list-style-type: none"> <li>a) National: This site is considered to be of Field Rating/Grade I significance and should be nominated as such (mention should be made of any relevant international ranking);</li> <li>b) Provincial: This site is considered to be of Field Rating/Grade II significance and should be nominated as such;</li> <li>c) Local: this site is of Field Rating/Grade IIIA significance. The site should be retained as a heritage register site (High significance) and so mitigation as part of the development process is not advised;</li> <li>d) Local: this site is of Field Rating/Grade IIIB significance. It could be mitigated and (part) retained as a heritage register site (High significance);</li> <li>e) 'General' Protection A (Field Rating IV A): this site should be mitigated before destruction (usually High/Medium significance);</li> <li>f) 'General' Protection B (Field Rating IV B): this site should be recorded before destruction (usually Medium significance);</li> <li>g) 'General' Protection C (Field Rating IV C): this site has been sufficiently recorded (in the Phase 1). It requires no further recording before destruction (usually Low significance).</li> </ul>	<p>N/A</p>
<p><b>K. Statement of Significance</b> (Heritage Value) giving the significant archaeological heritage value of relevant sites in terms of the legislation (NHRA, section 3 (3) listed below) or any other relevant criteria, and give reasons.</p> <ul style="list-style-type: none"> <li>a) a. its importance in the community, or pattern of South Africa's history;</li> <li>b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;</li> <li>c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;</li> <li>d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;</li> <li>e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;</li> <li>f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;</li> </ul>	<p>N/A no sites were found to have any significance</p>

<ul style="list-style-type: none"> <li>g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;</li> <li>h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and</li> <li>i) sites of significance relating to the history of slavery in South Africa.</li> </ul>	
<p><b>L. Recommendations</b> including:</p> <ul style="list-style-type: none"> <li>a) An assessment of the potential impact of the development on these sites, relative to sustainable social and economic benefits;</li> <li>b) Proposals for protection or mitigation relating to: <ul style="list-style-type: none"> <li>i. Possible alternatives in the development that might allow the protection and conservation of the sites; or</li> <li>ii. The need for mitigation of adverse impacts; or</li> <li>iii. The need to conserve certain sites because of their high heritage value.</li> </ul> </li> <li>c) Detailed recommendations with regard to burial grounds and graves. This must inform the client about the full process and enable the heritage authority to make decisions about permits. This must include: <ul style="list-style-type: none"> <li>i. Recommendations for protection of the grave(s) during the development and in the long term, e.g. fencing and plans for maintenance (mini-management plan); OR</li> <li>ii. Recommendations for relocation of the grave(s), public participation and possibly further archival research, or both (i &amp; ii).</li> </ul> </li> <li>d) An indication of what must be done at each site: <ul style="list-style-type: none"> <li>i. If the site is of Low4 Significance (see Kg above) the recommendation may be that the site must be mapped, documented and then destroyed (with a permit / letter of permission / Record of Decision from the heritage authority);</li> <li>ii. If the site is of Medium5 Significance the recommendation may be for a measure of mitigation after which the site may be destroyed. Mitigation usually involves a requirement to collect or excavate a sample of the cultural and other remains that will adequately allow characterization and dating of the site. (The archaeologist will require a permit for the excavation and collection. If, after this mitigation significant archaeological residues or parts of sites remain, the archaeologist should request the developer to apply for a permit for destruction or fill in the application for them to sign! In this way the heritage resources authority can help the archaeologist ensure that the recommended mitigation takes place;</li> <li>iii. If the site is of High Significance the recommendation may be that it be formally graded and conserved (with provision of boardwalks, fencing, signage, guides) and protected as a heritage resource (either being listed on the Heritage Register or being declared as a Provincial or National Heritage Site). If sites are to be protected a Site Management Plan should be required. For mini-plans, where small sites are incorporated into developments, this must include an indication of who is responsible for maintenance and how this process will be monitored.</li> </ul> </li> </ul>	<p>Section 11</p> <p>Section 11 and section 9</p> <p>N/A for Palaeontological assessment</p>
<p><b>M. Conclusions.</b></p>	<p>Section 12</p>
<p><b>N. Bibliography</b> detailing citations in the text of the report. Remember that all sources should be adequately acknowledged (even the web).</p>	<p>Section 13</p>
<p><b>O. Appendices</b> if any.</p>	<p>Yes</p>



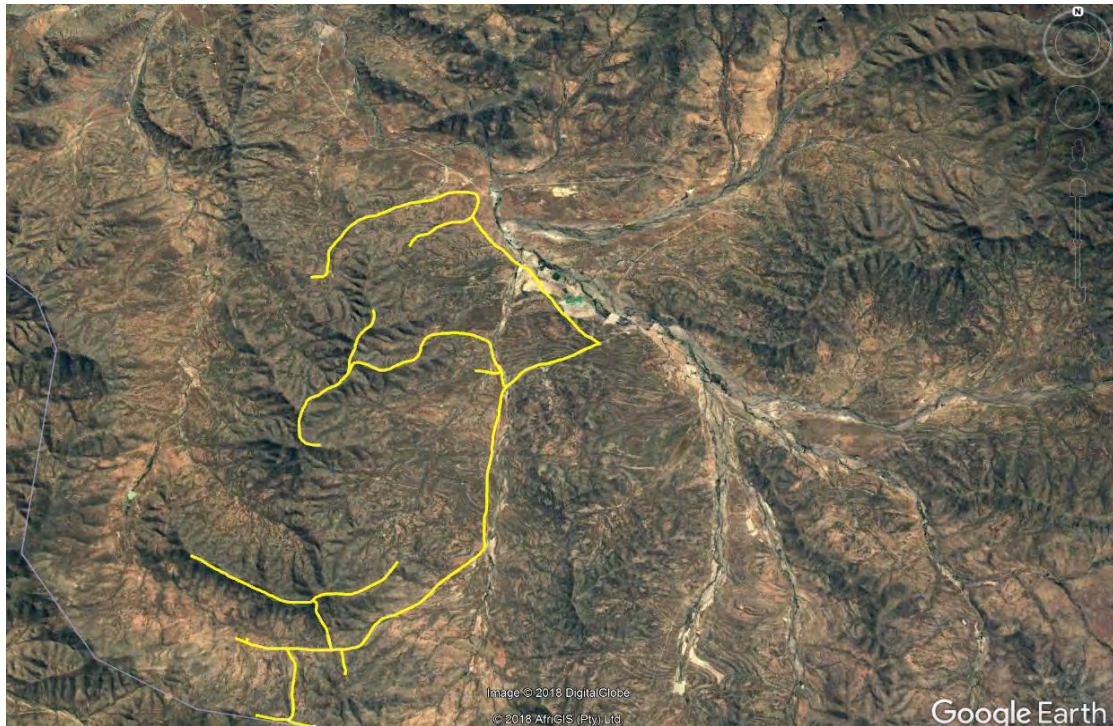
## **7.2 Assumptions and Limitation**

The accuracy of Palaeontological Impact Assessments is reduced by several factors which may include the following: the databases of institutions are not always up to date and relevant locality and geological information was not accurately documented in the past. Various remote areas of South Africa has not been assessed by palaeontologists and data is based on aerial photographs alone. Geological maps concentrate on the geology of an area and the sheet explanations was never intended to focus on palaeontological heritage.

Similar Assemblage Zones, but in different areas is used to provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations and Assemblage Zones generally assume that exposed fossil heritage is present within the development area. The accuracy of the Palaeontological Impact Assessment is thus improved considerably by conducting a field-assessment.

## **8 SITE VISIT**

As part of the PIA, a field-survey of the development footprint was conducted on 1-3 October 2018 to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed footprint of the development. A physical field-survey was conducted on foot by two observers within the proposed development footprint. Access to all of the locations of the proposed site proved to be difficult. However, as many as possible locations were investigated. The results of the field-survey, the author's experience, aerial photos (using Google Earth, 2018), topographical and geological maps and other reports from the same area were used to assess the proposed development footprint. No consultations were undertaken for this Impact Assessment as it will be undertaken as part of the EIA process.



*Figure 8: The approximate track followed for the site visit.*



*Figure 9: The general low-lying hilly terrain of the proposed development. Vegetation covers most of the surface and no outcrops were present. 32 °47' 12" S 20° 32' 05" E*



*Figure 10: Low lying hilly terrain covered by with vegetation. 32° 39' 27"S 20° 17' 47"E*



*Figure 11: Small exposure of grey overbank mudrocks, Access road Alternative South 2. Not fossiliferous. 32° 47' 00"S 20° 17' 26"E*



*Figure 12: Small overbank mudrock outcrop with blocky weathering. Not fossiliferous.  
32°47'1.75"S 20°17'22.30"E*



*Figure 13: Drainage channel. Not fossiliferous. 32°47'52.00"S 20°17'30.00"E*



*Figure 14: Small exposure of grey overbank mudrocks, Access road Alternative South 2. Not fossiliferous. 32° 47' 00"S 20° 17' 26"E.*



Figure 15: Surface gravels are unfossiliferous. 32°48'5.39"S 20°16'49.30"E





*Figure 16: Surface gravels with low laying mountain in the background. One sandstone ridge is present. Not fossiliferous. 32°48'13"S 20°18'05"E*



*Figure 17: Grey, blocky weathered, mudrocks of the Abrahamskraal Formation. Not fossiliferous.  
32°39'31.28"S 20°19'6.33"E.*



*Figure 18: Surface gravels. 32°45'18.00"S 20°20'59.68"E*



Figure 19: Tabular bedded sandstones with grey overbank mudrocks. Not fossiliferous.  
32°45'8.03"S 20°20'30.92"E.

## 9 FINDINGS AND RECOMMENDATIONS

The proposed Rondekop development site is underlain by the Abrahamskraal formation (Adelaide Subgroup, Beaufort group, of the Karoo Supergroup) and the Waterford formation of the Ecca group (Karoo Supergroup). The geologically older Waterford Formation is known for its trace fossils, occasional shelly invertebrates which include brachiopods and bivalves as well as fragmentary fish remains. Fossils of vascular plant (petrified wood), as well as stem and plant fragments are known from this formation as well as plant impressions.

The vertebrate fossils of the *Tapinocephalus Assemblage Zone* is not as abundantly found as in later assemblage zones. Fossils are generally recovered as single specimens and is often covered by brown-weathering calcareous nodular material. Large, complete articulated skeletons of *Bradysaurus* specimens are found in a dorsal-up position, while dinocephalian skulls with associated postcrania are extremely uncommon. Fauna present in this assemblage zone is mostly large bodied dinocephalians and pareiasaurs. A few isolated carnivore specimens of gorgonopsia (also known as sabre toothed reptiles), biarmosuchians and therocephalians have been recovered while pelycosaurus are uncommon.

The *Tapinocephalus* AZ is also known for large disarticulated amphibians as well as palaeoniscoid bony fish. The latter are mostly represented by scattered scales. Gastropods are represented by freshwater bivalves. Fragmentary vascular plant remains include roots, twigs and leaves and petrified wood. Trace fossils are also known from this assemblage zone and include traces of arthropod, tetrapod and worm burrows, tetrapod trackways, fossilized faeces (coprolites) and stem and plant casts are also present

Vertebrate fossils found in the Sutherland area include the tapinocephalid and titanosuchid dinocephalians, the pareiasaur *Bradysaurus*, as well as more uncommon dicynodonts, gorgonopsians and therocephalians. Several examples of plant remains has also been documented from this assemblage zone.

These Waterford and Abrahamskraal Formations have a very high palaeontological sensitivity on the PalaeoMap of SAHRIS (Almond et al, 2013). During a field survey of the development footprint (on foot and by motor vehicle), no fossiliferous outcrops were found. For this reason, a moderate palaeontological sensitivity is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Rondekop WEF development will be of a low significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

In my opinion the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

During the construction phase the deeper bedrock excavations (that is deeper than 1 m) should be monitored by the Environmental Control Officer (ECO) for fossil heritage. In the event that fossil remains are uncovered during any phase of construction, operation and decommissioning, either on the surface or unearthed by new excavations and vegetation clearance, the (ECO) in charge of these developments ought to be alerted immediately and the chance find protocol must be followed. These discoveries ought to be protected (if possible *in situ*) and the ECO must report to SAHRA (SAHRA for the Northern Cape (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)) so that correct mitigation (e.g. recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university

collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies proposed by SAHRA.

## **10 CHANCE FIND PROCEDURE**

- When a chance find is made the person must instantly stop all work near the find.
- The site must be secured to protect it from any additional damage
- The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.
- The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.
- Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.
- These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site
- The reports and all other documents will be submitted to SAHRA by the palaeontologist.
- The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.
- Once the required approvals have been issued, the Mine/development may carry on with the development.
- The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.
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## **11 IMPACT ASSESSMENT**

Impact on Palaeontological Heritage will only occur during the construction phase of the proposed development with no impacts on the preconstruction, operational and decommissioning phases. Impacts will only occur when the vegetation is cleared and levelled, and excavations into the bedrock will occur to erect the wind turbines and associated infrastructure in the development footprint.

The no-go alternative is not accessed per se as this option implies that no construction will take place and normal activities (farming) will continue as in the past. Impacts would thus be of very low significance.

### 11.1 Impact Ratings

Table 4: Palaeontological Impact Rating-Construction phase

<b>IMPACT TABLE</b>	
Environmental Parameter	Prevent the loss of Palaeontological Heritage
Issue/Impact/Environmental Effect/Nature	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study.
<i>Extent</i>	Excavation of the ground surface <i>of the site</i> (1)
<i>Probability</i>	As fossil heritage is known from these formations the probability of impacts on palaeontological heritage during the construction phase is probable (3).
<i>Reversibility</i>	Impacts on fossil heritage are usually <b>irreversible</b> . (4)
<i>Irreplaceable loss of resources</i>	By taking a precautionary approach, an insignificant loss of fossil resources is expected ( <b>No Loss</b> ). (1)
<i>Duration</i>	The expected duration of the impact is assessed as potentially permanent to <b>long term</b> . In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent (4).
<i>Cumulative effect</i>	The cumulative effect of the development of the WEF and associated infrastructure within the proposed location is considered to be <b>low</b> . This is as a result of the broader Sutherland area not being considered as fossiliferous.(1)

<i>Intensity/magnitude</i>	The intensity of the impact on fossil heritage is rated as <b>low (1)</b> .	
<i>Significance rating</i>	Low	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-14 (negative low)	-12 (negative low)
Mitigation measures	<p>Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase.</p> <p>Significant fossil finds to be reported to SAHRA for recording and sampling by a professional palaeontologist</p> <p>Chance find procedure must be followed.</p> <ul style="list-style-type: none"> <li>• When a chance find is made the person must instantly stop all work near the find.</li> <li>• The site must be secured to protect it from any additional damage</li> <li>• The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.</li> <li>• The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.</li> </ul>	



	<ul style="list-style-type: none"> <li>• Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.</li> <li>• These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site</li> <li>• The reports and all other documents will be submitted to SAHRA by the palaeontologist.</li> <li>• The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.</li> <li>• Once the required approvals have been issued, the Mine/development may carry on with the development.</li> <li>• The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.</li> </ul>
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## 11.2 Chance finds

Table 5: Chance finds impact rating

<b>IMPACT TABLE</b>	
Environmental Parameter	Prevent the loss of Palaeontological Heritage not identified during the site survey.
Issue/Impact/Environmental Effect/Nature	Due to the size of the project and the design method requiring surveying before identification of the layout, there is a possibility to come across fossil heritage not surveyed.
<i>Extent</i>	<i>Site (1)</i>

<i>Probability</i>	Possible (3)	
<i>Reversibility</i>	Irreversible (4)	
<i>Irreplaceable loss of resources</i>	By taking a precautionary approach, an insignificant loss of fossil resources is expected ( <b>No Loss</b> ). (1)	
<i>Duration</i>	Permanent (4)	
<i>Cumulative effect</i>	Low	
<i>Intensity/magnitude</i>	Low	
<i>Significance Rating</i>	<i>low</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-14 (negative low)	-12(negative low)
Mitigation measures	<p>Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase.  Significant fossil finds to be reported to SAHRA for recording and sampling by a professional palaeontologist  Chance find procedure must be followed.</p> <ul style="list-style-type: none"> <li>• When a chance find is made the person must instantly stop all work near the find.</li> <li>• The site must be secured to protect it from any additional damage</li> <li>• The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The</li> </ul>	

	<p>supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.</p> <ul style="list-style-type: none"><li>• The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.</li><li>• Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.</li><li>• These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site</li><li>• The reports and all other documents will be submitted to SAHRA by the palaeontologist.</li><li>• The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.</li><li>• Once the required approvals have been issued, the Mine/development may carry on with the development.</li><li>• The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.</li></ul>
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the Karoo area. *Without* mitigation the magnitude of cumulative impacts of this large number of WEFs and SEFs and associated infrastructure affecting the same fossiliferous rock sequences would be considerably higher and probable. He assessed the cumulative impact significance without mitigation as *medium*.

Table 6: Renewable Energy Facilities within a 50km radius of the Rondekop WEF include: (Information provided by SiVEST).

NAME	MEGAWATT CAPACITY	STATUS
Brandvalley WEF	140	Approved
Esizayo WEF	140	Approved
Gunstfontein WEF	200	Approved
Hidden Valley (Karusa & Soetwater) WEF	140 each	Preferred bidders. Construction to commence 2019
Hidden Valley (Greater Karoo) WEF	140	Approved
Kareebosch WEF	140	Approved
Komsberg West and East WEF	140 each	Approved
Kudusberg WEF	325	In process
Maralla WEF (East and West)	140 each	Approved
Perdekraal East WEF	110	Under Construction
Perdekraal West WEF	150	Approved
Rietkloof WEF	36	Approved
Roggeveld WEF	140	Preferred bidders. Construction to commence 2019
Sutherland WEF	140	Approved
Sutherland SEF	10	Approved
Tooverberg WEF	140	In process
Witberg WEF	120	Approved

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Table 7: Rating of Cumulative Impacts

<b>IMPACT TABLE</b>	
Environmental Parameter	Prevent the loss of Palaeontological Heritage
Issue/Impact/Environmental Effect/Nature	Damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study, this will occur during vegetation clearance or during the construction phase
<i>Extent</i>	National (3)
<i>Probability</i>	Since fossil heritage is known from these formations the probability of impacts on palaeontological heritage during the construction phase is probable. (3)
<i>Reversibility</i>	Impacts on fossil heritage are generally <b>irreversible</b> (4)
<i>Irreplaceable loss of resources</i>	By taking a precautionary approach, an insignificant loss of fossil resources is expected ( <b>No Loss</b> ). (1)
<i>Duration</i>	The expected duration of the impact is assessed as potentially permanent to <b>long term</b> . In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. (4)
<i>Cumulative effect</i>	The cumulative effect of the development of the WEF and associated infrastructure within the proposed location is considered to be <b>low</b> . This is as a result of the broader Sutherland area not being considered as fossiliferous (1).
<i>Intensity/magnitude</i>	Probable significant impacts on palaeontological heritage during the construction phase are high, but the intensity of the impact on fossil heritage is rated as low as fossil



	heritage is not common in the development area or in the greater Sutherland area (1)	
<i>Significance Rating</i>	Should the project progress without due care to the possibility of fossils being present at the proposed site in the Abrahamskraal Formation and Waterford Formation. The resultant damage, destruction or inadvertent relocation of any affected fossils will be <b>permanent and irreversible</b> . Thus, any fossils occurring within the area are potentially scientifically and culturally significant and any negative impact on them would be of <b>high</b> significance (without the implementation of mitigation measures).	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	3	1
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-16 (negative low)	-14 (negative low)
Mitigation measures	<p>Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase. Significant fossil finds to be reported to SAHRA for recording and sampling by a professional palaeontologist. The chance find procedure must be followed.</p> <ul style="list-style-type: none"> <li>• When a chance find is made the person must instantly stop all work near the find.</li> <li>• The site must be secured to protect it from any additional damage</li> <li>• The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the</li> </ul>	

	<p>find to the relevant Authorities and a relevant palaeontologist.</p> <ul style="list-style-type: none"> <li>• The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.</li> <li>• Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.</li> <li>• These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site</li> <li>• The reports and all other documents will be submitted to SAHRA by the palaeontologist.</li> <li>• The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.</li> <li>• Once the required approvals have been issued, the Mine/development may carry on with the development.</li> <li>• The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.</li> </ul>
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#### 11.4 Comparative Assessments of alternatives

The EIA for the proposed 325MW Rondekop Wind Energy Facility between Matjiesfontein Sutherland in the Northern Province comparative assessment of layout alternatives is described in detail below.

*Table 8: Comparative Assessments Rating*

**All alternatives may proceed.**

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
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<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>ACCESS ROADS</b>		
<b>NORTH RIDGE</b>		
Access Road Alternative North 1	No Preference	No Fossil Heritage was recovered
Access Road Alternative North 2	No Preference	No Fossil Heritage was recovered
<b>CENTRE RIDGE</b>		
Access Road Alternative Centre1	No Preference	No Fossil Heritage was recovered
Access Road Alternative Centre 2	No Preference	No Fossil Heritage was recovered
<b>SOUTHERN RIDGE</b>		
Access Road Alternative South 1	No Preference	No Fossil Heritage was recovered
Access Road Alternative South 2	No Preference	No Fossil Heritage was recovered
<b>CONSTRUCTION CAMPS</b>		
Construction Camp Alternative 1	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 2	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 3	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 4	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 5	No Preference	No Fossil Heritage was recovered
Construction Camp Alternative 6	No Preference	No Fossil Heritage was recovered
<b>SUBSTATIONS</b>		
Substation Alternative 1	No Preference	No Fossil Heritage was recovered
Substation Alternative 2	No Preference	No Fossil Heritage was recovered
Substation Alternative 3	No Preference	No Fossil Heritage was recovered
Substation Alternative 4	No Preference	No Fossil Heritage was recovered
Substation Alternative 5	No Preference	No Fossil Heritage was recovered
Substation Alternative 6	No Preference	No Fossil Heritage was recovered

## 11.5 Impact Summary

Table 9: Comparison of summarised impacts on environmental parameters

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post	Average

				mitigation	
Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-80	Negative very high Impact	18	Negative low Impact
Chance find impacts	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-19	Negative low Impact	-18	Negative low Impact
Cumulative impact	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	-96	Negative very high Impact	-18	Negative low Impact
Impact associated with the no-go alternative	Destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study	Neutral	Neutral	Neutral	Neutral

## 12 CONCLUSION

The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Rondekop WEF development will be of a **low significance** in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the **construction of the development may be authorised in its whole extent**, as the development footprint is not considered sensitive in terms of palaeontological resources. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

During the construction phase the deeper bedrock excavations (that is deeper than 1 m) should be monitored by the Environmental Control Officer (ECO) for fossil heritage. In the event that fossil remains are uncovered during any phase of construction, operation and decommissioning, either on the surface or unearthed by new excavations and vegetation clearance, the (ECO) in charge of these developments ought to be alerted immediately and the chance find protocol must be followed. These discoveries ought to be protected (if possible *in situ*) and the ECO must report to SAHRA (SAHRA for the Northern Cape (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web:

[www.sahra.org.za](http://www.sahra.org.za)) so that correct mitigation (e.g. recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies proposed by SAHRA.

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### **APPENDIX 3: *Environmental impact assessment methodology***

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

## Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 3.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

## Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

## Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

<b>NATURE</b>
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.

<b>GEOGRAPHICAL EXTENT</b>		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
<b>PROBABILITY</b>		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
<b>REVERSIBILITY</b>		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
<b>IRREPLACEABLE LOSS OF RESOURCES</b>		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.

4	Complete loss of resources	The impact is result in a complete loss of all resources.
<b>DURATION</b>		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
<b>CUMULATIVE EFFECT</b>		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
<b>INTENSITY / MAGNITUDE</b>		
Describes the severity of an impact		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

### SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

**(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.**

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Rating	Significance	Description
6 to 28	Negative Low impact		The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact		The anticipated impact will have minor positive effects.

29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report.

<b>IMPACT TABLE FORMAT</b>	
Environmental Parameter	<i>A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water</i>
Issue/Impact/Environmental Effect/Nature	<i>A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water</i>
<i>Extent</i>	<i>A brief description of the area over which the impact will be expressed</i>
<i>Probability</i>	<i>A brief description indicating the chances of the impact occurring</i>
<i>Reversibility</i>	<i>A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity</i>
<i>Irreplaceable loss of resources</i>	<i>A brief description of the degree in which irreplaceable resources are likely to be lost</i>
<i>Duration</i>	<i>A brief description of the amount of time the proposed activity is likely to take to its completion</i>

<i>Cumulative effect</i>	<i>A brief description of whether the impact will be exacerbated as a result of the proposed activity</i>	
<i>Intensity/magnitude</i>	<i>A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily</i>	
<i>Significance Rating</i>	<i>A brief description of the importance of an impact which in turn dictates the level of mitigation required</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	<i>Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analyzing the significance. These measures will be detailed in the EMP.</i>	

### Impact Summary

The impacts will then be summarized and a comparison made between pre and post mitigation phases as shown in Table 4 below. The rating of environmental issues associated with different parameters prior to and post mitigation of a proposed activity will be averaged. A comparison will then be made to determine the effectiveness of the proposed mitigation measures. The comparison will identify critical issues related to the environmental parameters.

The table below is to be represented in the Executive Summary of the report.

<b>Environmental parameter</b>	<b>Issues</b>	<b>Rating prior to mitigation</b>	<b>Average</b>	<b>Rating post mitigation</b>	<b>Average</b>
Surface water	Erosion	43		16	
	Oil spills	22		22	

	Alteration of aquatic biota	16		3	
			- 27		-13.67
			Low Negative Impact		Low Negative Impact

Table 10: Comparison of summarised impacts on environmental parameters

Finally, the 2014 regulations also specify that alternatives must be compared in terms of impact assessment. Hence all alternatives will need to be comparatively assessed.

**APPENDIX 4: CURRICULUM VITAE: ELIZE BUTLER**

**PROFESSION:** Palaeontologist  
**YEARS' EXPERIENCE:** 25 years in Palaeontology

**EDUCATION:**

- B.Sc Botany and Zoology, 1988  
University of the Orange Free State
- B.Sc (Hons) Zoology, 1991  
University of the Orange Free State
- Management Course, 1991  
University of the Orange Free State
- M. Sc. *Cum laude* (Zoology), 2009  
University of the Free State

**Dissertation title:** The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

Registered as a PhD fellow at the Zoology Department of the UFS  
2013 to current

**Dissertation title:** A new gorgonopsian from the uppermost *Daptocephalus Assemblage Zone*, in the Karoo Basin of South Africa

**MEMBERSHIP**

Palaeontological Society of South Africa (PSSA) 2006-currently



## EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–currently

## TECHNICAL REPORTS

**Butler, E. 2014.** Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province.

**Butler, E. 2014.** Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoort, Northern Cape Province. 2014.

**Butler, E. 2015.** Palaeontological impact assessment of the proposed consolidation, re-division and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape.

**Butler, E. 2015.** Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. 2015.

**Butler, E. 2015.** Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. 2015.

**Butler, E. 2015.** Palaeontological impact assessment of the proposed Orange Grove 3500 residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape. 2015

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Gonubie residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape Province.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Ficksburg raw water pipeline.

**Butler, E. 2015.** Palaeontological Heritage Impact Assessment report on the establishment of the 65 mw Majuba Solar Photovoltaic facility and associated infrastructure on portion 1, 2 and 6 of the farm Witkoppies 81 HS, Mpumalanga Province.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed township establishment on the remainder of portion 6 and 7 of the farm Sunnyside 2620, Bloemfontein, Mangaung metropolitan municipality, Free State, Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Woodhouse 1 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse729, near Vryburg, North West Province.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Woodhouse 2 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Orkney solar energy farm and associated infrastructure on the remaining extent of Portions 7 and 21 of the farm Wolvehuis 114, near Orkney, North West Province..

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Spectra foods broiler houses and abattoir on the farm Maiden Manor 170 and Ashby Manor 171, Lukhanji Municipality, Queenstown, Eastern Cape Province.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoot, Northern Cape. Prepared for Savannah Environmental.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Woodhouse 1 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Woodhouse 2 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Savannah SA.

**Butler, E. 2016.** Proposed 132kV overhead power line and switchyard station for the authorised Solis Power 1 CSP project near Upington, Northern Cape. Savannah SA

**Butler, E. 2016.** Palaeontological Impact Assessment of of the proposed Senqu Pedestrian Bridges in Ward 5 of Senqu Local Municipality, Eastern Cape Province.

**Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Modderfontein Filling Station On Erf 28 Portion 30, Founders Hill, City Of Johannesburg, Gauteng Province.

**Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Modikwa Filling Station on a Portion of Portion 2 of Mooihoek 255 Kt, Greater Tubatse Local Municipality, Limpopo Province.

**Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Heidedal filling station on Erf 16603, Heidedal Extension 24, Mangaung Local Municipality, Bloemfontein, Free State Province.

**Butler, E. 2016.** Recommended Exemption from further Palaeontological studies: Proposed Construction of the Gunstfontein Switching Station, 132kv Overhead Power Line (Single Or Double Circuit) and ancillary infrastructure for the Gunstfontein Wind Farm Near Sutherland, Northern Cape Province. Savannah South Africa.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province.

**Butler, E. 2016.** Chris Hani District Municipality Cluster 9 water backlog project phases 3a and 3b: Palaeontology inspection at Tsomo WTW.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoot, Northern Cape. Savannah South Africa.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed upgrading of the main road MR450 (R335) from the Motherwell to Addo within the Nelson Mandela Bay Municipality and Sunday's river valley Local Municipality, Eastern Cape Province. Terratest.

**Butler, E. 2016.** Palaeontological Impact Assessment construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape province. Savannah South Africa.

**Butler, E. 2016.** Palaeontological Impact Assessment for the proposed construction of up to a 132kv power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces. PGS Heritage.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed development of two burrow pits (DR02625 and DR02614) in the Enoch Mgijima Municipality, Chris Hani District, Eastern Cape..

**Butler, E. 2016.** Ezibeleni waste Buy-Back Centre (near Queenstown), Enoch Mgijima Local Municipality, Eastern Cape.

**Butler, E. 2016.** Palaeontological Impact Assessment for the proposed construction of two 5 Mw Solar Photovoltaic Power Plants on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, Leeudoringstad, North West Province.

**Butler, E. 2016.** Palaeontological Impact Assessment for the proposed development of four Leeuwborg Wind farms and basic assessments for the associated grid connection near Loeriesfontein, Northern Cape Province.

**Butler, E. 2016.** Palaeontological impact assessment for the proposed Aggeneys south prospecting right project, Northern Cape Province.

**Butler, E. 2016.** Palaeontological impact assessment of the proposed Motuoane Ladysmith Exploration right application, Kwazulu Natal.

**Butler, E. 2016.** Palaeontological impact assessment for the proposed construction of two 5 MW solar photovoltaic power plants on farm Wildebeestkuil 59 and farm Leeuwbosch 44, Leeudoringstad, North West Province.

**Butler, E. 2016.:** Palaeontological desktop assessment of the establishment of the proposed residential and mixed use development on the remainder of portion 7 and portion 898 of the farm Knopjeslaagte 385 Ir, located near Centurion within the Tshwane Metropolitan Municipality of Gauteng Province.

**Butler, E. 2017.** Palaeontological impact assessment for the proposed development of a new cemetery, near Kathu, Gamagara local municipality and John Taolo Gaetsewe district municipality, Northern Cape.

**Butler, E. 2017.** Palaeontological Impact Assessment Of The Proposed Development Of The New Open Cast Mining Operations On The Remaining Portions Of 6, 7, 8 And 10 Of The Farm Kwaggafontein 8 In The Carolina Magisterial District, Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Development of a Wastewater Treatment Works at Lanseria, Gauteng Province.

**Butler, E. 2017.** Palaeontological Scoping Report for the Proposed Construction of a Warehouse and Associated Infrastructure at Perseverance in Port Elizabeth, Eastern Cape Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Establishment of a Diesel Farm and a Haul Road for the Tshipi Borwa mine Near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Changes to Operations at the UMK Mine near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province.

**Butler, E. 2017.** Palaeontological Impact Assessment for the Development of the Proposed Ventersburg Project-An Underground Mining Operation near Ventersburg and Henneman, Free State Province.

**Butler, E. 2017.** Palaeontological desktop assessment of the proposed development of a 3000 MW combined cycle gas turbine (CCGT) in Richards Bay, Kwazulu-Natal.

**Butler, E. 2017.** Palaeontological Impact Assessment for the Development of the Proposed Revalidation of the lapsed General Plans for Elliotdale, Mbhashe Local Municipality.

**Butler, E. 2017.** Palaeontological assessment of the proposed development of a 3000 MW Combined Cycle Gas Turbine (CCGT) in Richards Bay, Kwazulu-Natal.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed development of the new open cast mining operations on the remaining portions of 6, 7, 8 and 10 of the farm Kwaggafontein 8 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed mining of the farm Zandvoort 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of open pit mining at Pit 36W (New Pit) and 62E (Dishaba) Amandelbult Mine Complex, Thabazimbi, Limpopo Province.

**Butler, E. 2017.** Palaeontological impact assessment of the proposed development of the sport precinct and associated infrastructure at Merrifield Preparatory school and college, Amathole Municipality, East London. PGS Heritage.

**Butler, E. 2017.** Palaeontological impact assessment of the proposed construction of the Lehae training and fire station, Lenasia, Gauteng Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the new open cast mining operations of the Impunzi mine in the Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the construction of the proposed Viljoenskroon Munic 132 KV line, Vierfontein substation and related projects.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed rehabilitation of 5 ownerless asbestos mines.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the Lephalale coal and power project, Lephalale, Limpopo Province, Republic of South Africa.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of a 132KV powerline from the Tweespruit distribution substation (in the Mantsopa local municipality) to the Driedorp rural substation (within the Naledi local municipality), Free State province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the new coal-fired power plant and associated infrastructure near Makhado, Limpopo Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of a Photovoltaic Solar Power station near Collett substation, Middelberg, Eastern Cape.

**Butler, E. 2017.** Palaeontological Impact Assessment for the proposed township establishment of 2000 residential sites with supporting amenities on a portion of farm 826 in Botshabelo West, Mangaung Metro, Free State Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed prospecting right project without bulk sampling, in the Koa Valley, Northern Cape Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed Aroams prospecting right project, without bulk sampling, near Aggeneys, Northern Cape Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed Belvoir aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape.

**Butler, E. 2017.** PIA site visit and report of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of Tina Falls Hydropower and associated power lines near Cumbu, Mthlontlo Local Municipality, Eastern Cape.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed construction of the Mangaung Gariep Water Augmentation Project.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed Belvoir aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of the Melkspruit-Rouxville 132KV Power line.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of a railway siding on a portion of portion 41 of the farm Rustfontein 109 is, Govan Mbeki local municipality, Gert Sibande district municipality, Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed consolidation of the proposed Ilima Colliery in the Albert Luthuli local municipality, Gert Sibande District Municipality, Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed extension of the Kareerand Tailings Storage Facility, associated borrow pits as well as a storm water drainage channel in the Vaal River near Stilfontein, North West Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed construction of a filling station and associated facilities on the Erf 6279, district municipality of John Taolo Gaetsewe District, Ga-Segonyana Local Municipality Northern Cape.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed of the Lephhalale Coal and Power Project, Lephhalale, Limpopo Province, Republic of South Africa.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Overvaal Trust PV Facility, Buffelspoort, North West Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed development of the H2 Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspruit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed upgrade of the Sandriver Canal and Klippan Pump station in Welkom, Free State Province.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed upgrade of the 132kv and 11kv power line into a dual circuit above ground power line feeding into the Urania substation in Welkom, Free State Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed diamonds alluvial & diamonds general prospecting right application near Christiana on the remaining extent of portion 1 of the farm Kaffraria 314, registration division HO, North West Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga.

**Butler, E. 2018.** Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State.

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province.

**Butler, E. 2018.** Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. 2018.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape.

**Butler, E. 2018.** Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province.

**Butler, E. 2018.** Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province.

- Butler, E. 2018.** Palaeontological Field Assessment for the proposed re-alignment and decommissioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province.
- Butler, E. 2018.** Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London.
- Butler, E. 2018.** Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London.
- Butler, E. 2018.** Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province.
- Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province
- Butler, E. 2018.** Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328.
- Butler, E. 2018.** Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng.
- Butler, E. 2018** Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province.
- Butler, E. 2018.** Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province.
- Butler, E. 2018.** Palaeontological Field Assessment of the proposed Megamor Extension, East London.
- Butler, E. 2018.** Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division HO, North West Province.

## CONFERENCE CONTRIBUTIONS

### NATIONAL

#### PRESENTATION

- Butler, E., Botha-Brink, J., and F. Abdala. A new gorgonopsian from the uppermost *Dicynodon Assemblage Zone*, Karoo Basin of South Africa. 18 the Biennial conference of the PSSA 2014. Wits, Johannesburg, South Africa.

### INTERNATIONAL

- Attended the Society of Vertebrate Palaeontology 73<sup>th</sup> Conference in Los Angeles, America. October 2012.

## CONFERENCES: POSTER PRESENTATION

### NATIONAL

- Butler, E., and J. Botha-Brink. Cranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. University of the Free State Seminar Day, Bloemfontein. South Africa. November 2007.



Butler, E., and J. Botha-Brink. Postcranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. 14<sup>th</sup> Conference of the PSSA, Matjesfontein, South Africa. September 2008:

Butler, E., and J. Botha-Brink. The biology of the South African non-mammaliaform cynodont *Galesaurus planiceps*. 15<sup>th</sup> Conference of the PSSA, Howick, South Africa. August 2008.

#### INTERNATIONAL VISITS

Natural History Museum, London

July 2008

Paleontological Institute, Russian Academy of Science, Moscow

November 2014

