

**HERITAGE SURVEY OF THE PROPOSED LEPHALALE
SOLAR PROJECT, LEPHALALE LOCAL
MUNICIPALITY WATERBERG DISTRICT, LIMPOPO
PROVINCE**

**FOR K2021699383 (SOUTH AFRICA) (PTY) LTD
(REG NO 2021/699383/07)**

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Abbreviations

HP	Historical Period
IIA	Indeterminate Iron Age
LIA	Late Iron Age
EIA	Early Iron Age
ISA	Indeterminate Stone Age
ESA	Early Stone Age
MSA	Middle Stone Age
LSA	Late Stone Age
HIA	Heritage Impact Assessment
PIA	Palaeontological Impact Assessment

INTRODUCTION

The Lephalale Solar facility is being developed with a maximum installed capacity of 100 MWp (DC) which produces 80 MWac (AC) of electricity. The facility will be in operation for at least 20 years. It is important to note that the final specifications of the project components will be determined during the detailed engineering phase which would commence after receipt of an Environmental Authority from the competent authority.

The proposed project would entail the development of a Photovoltaic (PV) solar power plant up to 256 hectares in extent with a generation capacity of approximately 100MWp (80 MWac) covering the entire feasible area. The final capacity would be dependent on ongoing development of photovoltaic technologies, as more efficient modules may become available by the time that the project would begin construction. The development footprint is approximately 256 hectares; however the generation capacity may vary based on the availability of more efficient PV panels.

The solar facility will consist of:

- Solar PV panels,
- Steel support structure and tracker system on concrete foundations,
- Inverter stations as part of the PV field,
- Transformers, switchgear and related equipment as part of the Substations, and
- Internal roads.

The project associated infrastructure will consist of:

- Substation complex (33/132 kV) including control rooms and grid control yards,
- Existing Grootegeluk substation upgrades,
- 132 kV Transmission line and transmission towers,

- Battery Energy Storage System (BESS),
- Operations and maintenance buildings,
- Water provision,
- Access roads,
- Internal roads,
- Perimeter fencing,
- Access control gate,
- Security building,
- Temporary concrete batching facility,
- Temporary offices for the construction period,
- Construction yard, and
- Laydown area

Umlando was requested to undertake the HIA for the development. Mr Frans Roodt undertook the field survey on behalf of Umlando (see Appendix A for the original report).

FIG. 1 GENERAL LOCATION OF THE STUDY AREA



FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA



FIG. 3: TOPOGRAPHICAL MAP OF THE STUDY AREA

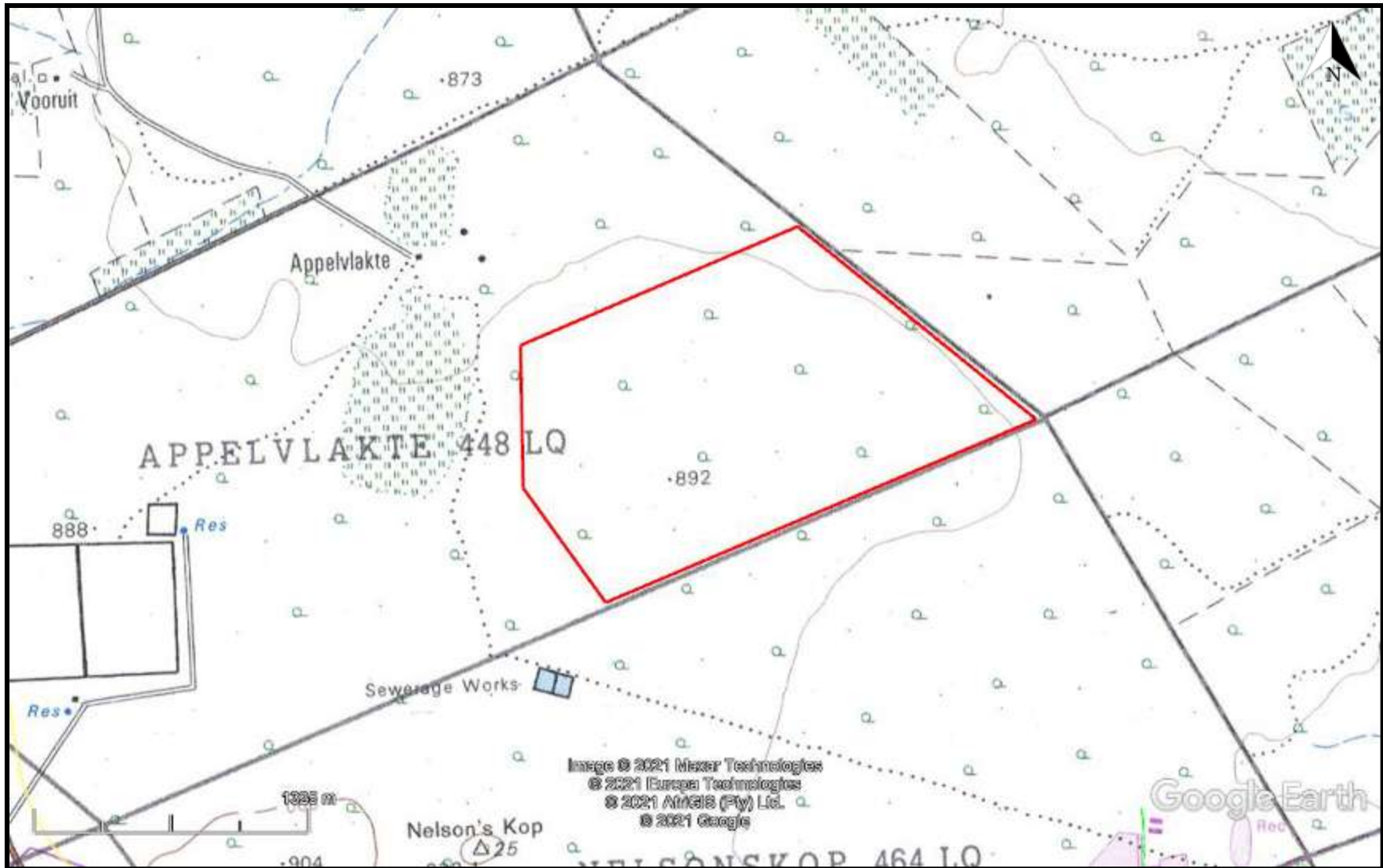


FIG. 4: SCENIC VIEWS OF THE STUDY AREA



NATIONAL HERITAGE RESOURCES ACT OF 1999

The National Heritage Resources Act of 1999 (pp 12-14) protects a variety of heritage resources. These resources are defined as follows:

1. “For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.
2. Without limiting the generality of subsection (1), the national estate may include—
 - 2.1. Places, buildings, structures and equipment of cultural significance;
 - 2.2. Places to which oral traditions are attached or which are associated with living heritage;
 - 2.3. Historical settlements and townscapes;
 - 2.4. Landscapes and natural features of cultural significance;
 - 2.5. Geological sites of scientific or cultural importance;
 - 2.6. Archaeological and palaeontological sites;
 - 2.7. Graves and burial grounds, including—
 - 2.7.1. Ancestral graves;
 - 2.7.2. Royal graves and graves of traditional leaders;
 - 2.7.3. Graves of victims of conflict;
 - 2.7.4. Graves of individuals designated by the Minister by notice in the Gazette;
 - 2.7.5. Historical graves and cemeteries; and
 - 2.7.6. Other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
3. Sites of significance relating to the history of slavery in South Africa;
 - 3.1. Movable objects, including—

4. Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - 4.1. Objects to which oral traditions are attached or which are associated with living heritage;
 - 4.2. Ethnographic art and objects;
 - 4.3. Military objects;
 - 4.4. objects of decorative or fine art;
 - 4.5. Objects of scientific or technological interest; and
 - 4.6. books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).
5. Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—
 - 5.1. Its importance in the community, or pattern of South Africa's history;
 - 5.2. Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
 - 5.3. Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
 - 5.4. Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
 - 5.5. Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
 - 5.6. Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
 - 5.7. Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
 - 5.8. 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

5.9. sites of significance relating to the history of slavery in South Africa”

METHOD

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. These database contain archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (<http://www.vuvuzela.com/googleearth/monuments.html>) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually

occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

Defining significance

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

1. State of preservation of:

- 1.1. Organic remains:
 - 1.1.1. Faunal
 - 1.1.2. Botanical
- 1.2. Rock art
- 1.3. Walling
- 1.4. Presence of a cultural deposit
- 1.5. Features:
 - 1.5.1. Ash Features
 - 1.5.2. Graves
 - 1.5.3. Middens
 - 1.5.4. Cattle byres
 - 1.5.5. Bedding and ash complexes

2. Spatial arrangements:

- 2.1. Internal housing arrangements
- 2.2. Intra-site settlement patterns
- 2.3. Inter-site settlement patterns

3. Features of the site:

- 3.1. Are there any unusual, unique or rare artefacts or images at the site?

3.2. Is it a type site?

3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

4.1. Providing information on current research projects

4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?

5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

7. Educational:

7.1. Does the site have the potential to be used as an educational instrument?

7.2. Does the site have the potential to become a tourist attraction?

7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

8.1. Palaeontological sites

8.2. Historical buildings

8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites

8.4. Graves and/or community cemeteries

8.5. Living Heritage Sites

8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts.

The above significance ratings allow one to grade the site according to SAHRA's grading scale. This is summarised in Table 1.

TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES

SITE SIGNIFICANCE	FIELD RATING	GRADE	RECOMMENDED MITIGATION
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A / 3B	
High / Medium Significance	Generally Protected A		Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B		Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C		On-site sampling monitoring or no archaeological mitigation required prior to or during development / destruction

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. I also used various sources for historical information.

PREVIOUS ACHAEOLOGICAL & HERITAGE SURVEYS

Several HIA studies have been undertaken in the surrounding areas (Pistorius 2007, 2010; van der Walt 2012, 2014, 2016; Huffman and van der Walt 2008a, 2008b, 2011, 2012; van Schalkwyk 2005a, 2005b, 2006, 2007, 2008. Van der Walt (2016) surveyed parts of the Farm Appelvlakte. No sites were recorded in the current study area and the dense vegetation was noted. Fig. 5 shows the location of known heritage sites in the general area.

No national monuments, battlefields, or historical cemeteries are known to occur within the study area.

The Farm Appelvlakte 448 LQ was first surveyed in 1908, and probably granted shortly thereafter (fig. 6). The area may have been under lease before being granted. The surveyors map does not indicate any buildings

The 1969 map indicates the study area is undeveloped and that there are no buildings (fig. 7).

The desktop study suggests that there will have a low occurrence of archaeological and historical sites.

FIG. 5: KNOWN HERITAGE SITES IN THE AREA



FIG. 6: SURVEYOR GENERAL MAP OF APPELVLAKTE (1908)

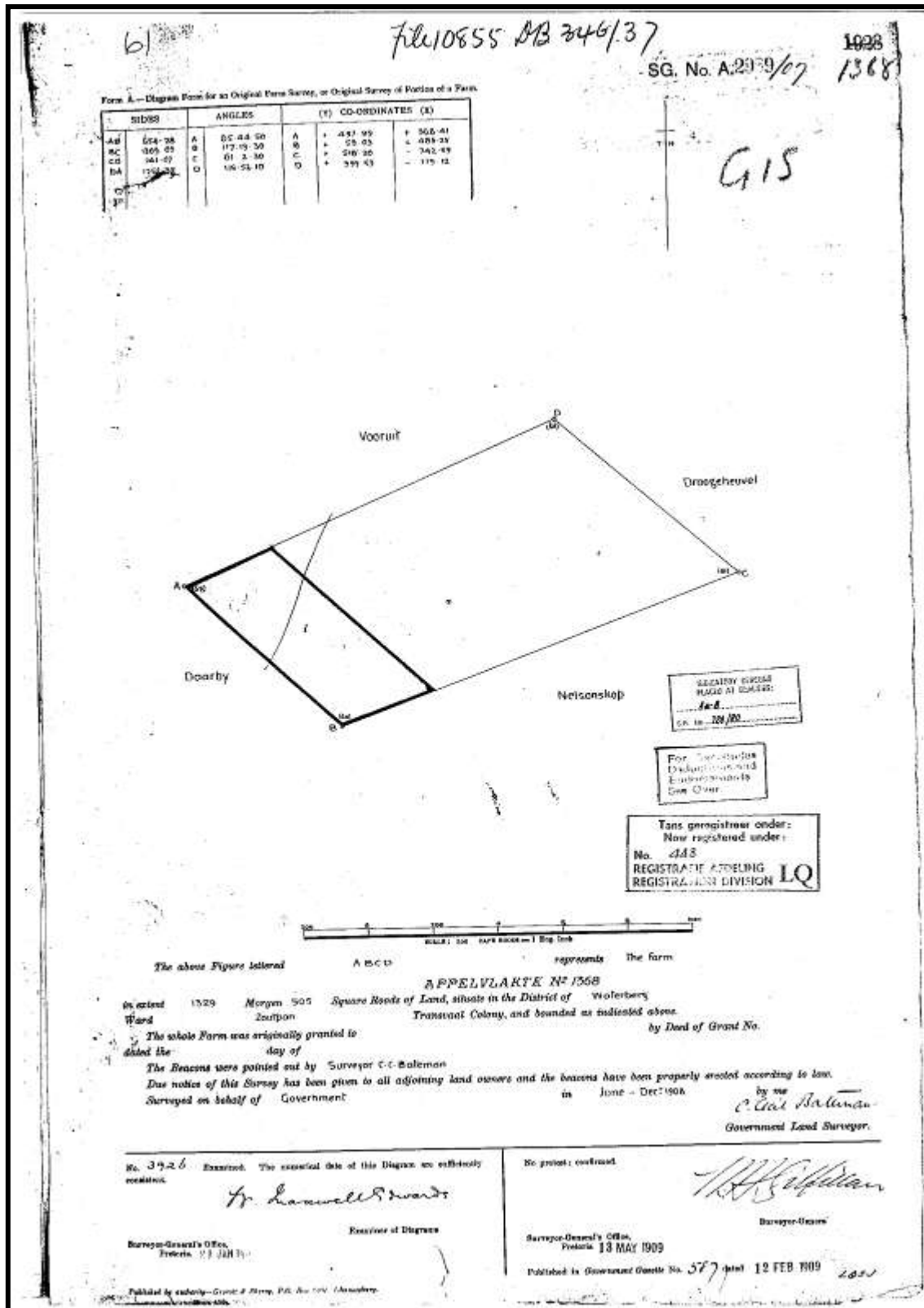
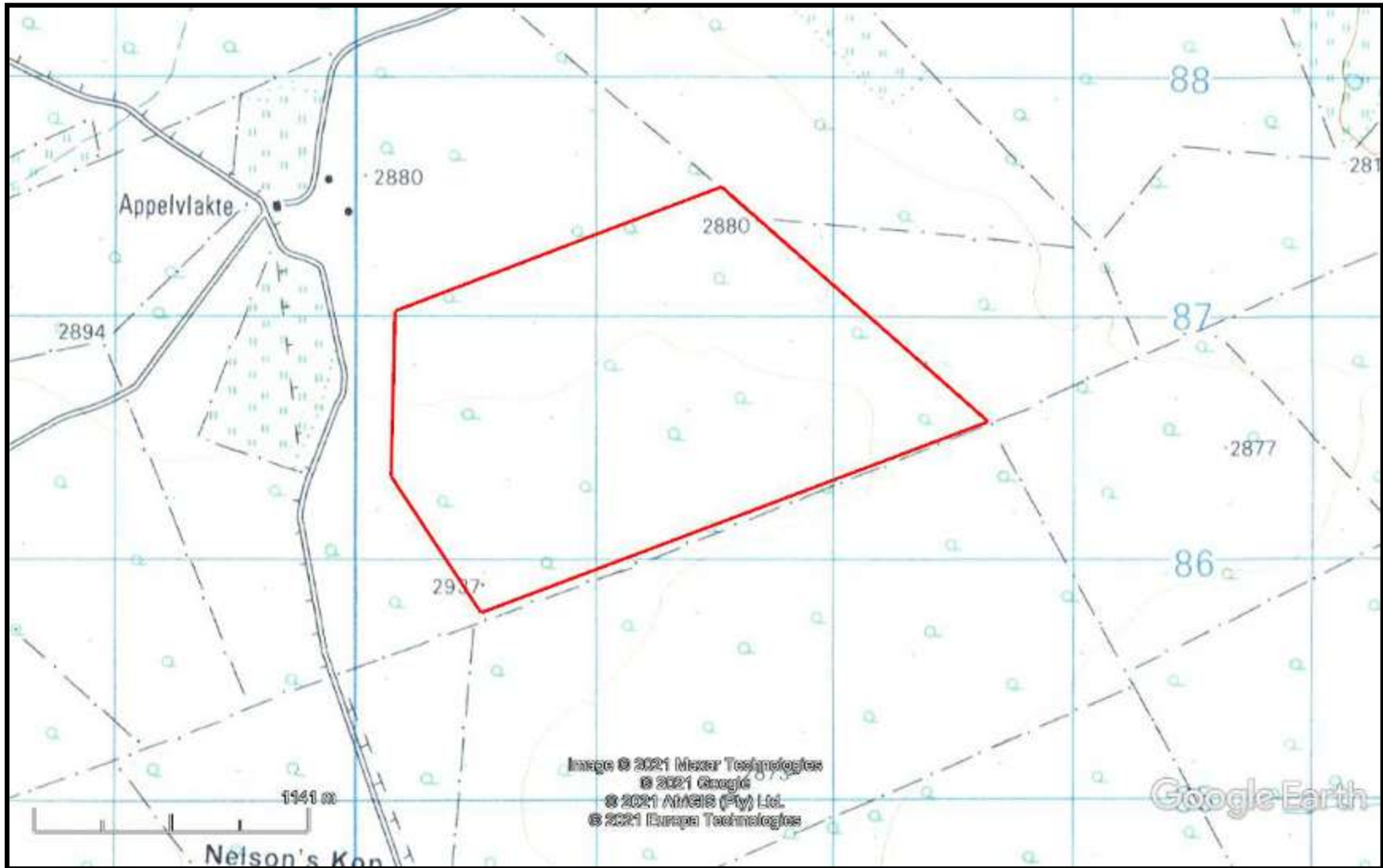


FIG. 7: TOPGRAPHICAL MAP OF APPELVLAKTE (1969)



PALAEONTOLOGICAL DESKTOP STUDY

The palaeontology of the area is considered to be of high significance (fig. 8). A desktop study was undertaken by Dr. Alan Smith (Appendix B).

FIG. 8: PALAEONTOLOGICAL SENSITIVITY OF THE STUDY AREA



COLOUR	SENSITIVITY	REQUIRED ACTION
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

The PIA desktop notes that this site is underlain by Clarence Formation which is part of the Karoo Sequence. The Lower Jurassic aged Clarence Formation comprises predominantly fine-medium-grained sandstone and forms spectacular cliffs. The Formation is interpreted as an Aeolian deposit (desert dunes). This was a continent-scale desert.

This project will have a very shallow foundation, consequently there will be very little disturbance to any palaeontological material. However a “Chance Find Protocol” has been included.

The chance of significant fossils being found on this site is Low, but not Zero. Consequently a “Chance Find Protocol” has been included to cover this eventuality. No further palaeontological work is required, unless triggered by the “Chance Find Protocol”, which must form part of the Environmental Management Program (EMPr) for the site. Should palaeontological material be found, a suitably qualified palaeontologist must inspect the find.

FIELD SURVEY

The field survey was undertaken by Mr Frans Roodt in June 2021 as Umlando could not undertake the survey when the fieldwork dates were changed.

Stone Age remains

No Stone Age material was detected in the study area. Stone Age material may occur as chance finds or exposed during earthworks. Isolated stone tools could occur and these would not constitute a site.

The study terrain is not suitable for Rock Art as there are no large loose-standing boulders or rock overhangs which would facilitate rock art.

Late Iron Age (Early Farming Communities)

No Iron Age (Farming communities) cultural material was detected in the project area..

Graves and burials sites

No graves or burial sites were detected in the project area. Various burial sites and graves were, however, recorded to the south-west at Medupi Power Station by Mbofho Consulting and Project Managers during a community remedial process. The proposed project will have no impact on community graves.

The built environment / historical structures

No historical structures or farmstead was detected in the project area. The original Appelvlakte Farm buildings occur outside of the study area, and appear to be ruins from the Google Earth imagery. These will not be affected by the proposed development.

MANAGEMENT PLAN

The archaeological and historical record for this specific study area is of low significance. No heritage sites have been recorded, although isolated artefacts would probably occur. If any artefacts are noted, then the ECO can send them to the heritage practitioner for comment. These would be Chance Finds and not hinder the development.

The palaeontology of the area is considered to be of high significance. However, the probability of finding palaeontological material in the upper weathered deposits is very low. . If any artefacts are noted, then the ECO can send them to the heritage practitioner for comment. These would be Chance Finds and not hinder the development.

No further mitigation is required for the proposed photovoltaic plant.

CONCLUSION

A heritage survey was undertaken for the proposed Grootgeluk photovoltaic plant. Several heritage sites have been recorded outside of the study area and included

historical buildings, Stone Age material and human graves. No heritage sites were recorded within the study area.

A chance find protocol was suggested for the palaeontological aspect of the project.

No further mitigation is required for the photovoltaic plant.

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EXPERIENCE OF THE HERITAGE CONSULTANT

Gavin Anderson has a M. Phil (in archaeology and social psychology) degree from the University of Cape Town. Gavin has been working as a professional archaeologist and heritage impact assessor since 1995. He joined the Association of Professional Archaeologists of Southern Africa in 1998 when it was formed. Gavin is rated as a Principle Investigator with expertise status in Rock Art, Stone Age and Iron Age studies. In addition to this, he was worked on both West and East Coast shell middens, Anglo-Boer War sites, and Historical Period sites.

DECLARATION OF INDEPENDENCE

I, Gavin Anderson, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

A handwritten signature in black ink, appearing to read 'G. Anderson', with a horizontal line underneath.

Gavin Anderson
Archaeologist/Heritage Impact Assessor

APPENDIX A
AIA FIELD SURVEY

PHASE 1 CULTURAL HERITAGE IMPACT ASSESSMENT REPORT

PROPOSED GROOTGELUK

FOR: GCS Water & Environmental Consultants (Pty) Ltd

63 Wessel Road,
Rivonia, Johannesburg,
South Africa

Executive Summary

This report addresses the development of the Grootgeluk Photovoltaic (PV) solar power plant. It is 256 hectares in extent with a generation capacity of approximately 100MWp (80 MWac) covering the entire project area.

- A literature study and field survey of the project area was undertaken;
- The project area contains no known heritage resources. This is mainly due to the fact that the area is arid with no reliable water sources. People preferred to live near perennial water sources or springs, but would have utilised the area to collect resources and for livestock herding. Hunter-gatherers would have utilised seasonal pans;
- There is a risk that Stone Age material is likely to occur subterranean, but that will only be exposed when earthworks commence.

In view of the findings of the study no specific mitigation measures are recommended other than;

- The environmental control officer must be made aware of the fact that Stone Age material may be exposed during earthworks and that an archaeologist must be consulted for an assessment and further action.

From a heritage resources management perspective there is no objection towards the proposed development.

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1. INTRODUCTION AND TERMS OF REFERENCE

1.1 Introduction

The author was contracted by the Environmental Assessment Practitioner; GCS Water and Environmental Consultants, to undertake a Phase 1 Heritage Impact Assessment of the proposed Grootgeluk Solar Project.

The applicant proposes to generate electricity from the solar energy resource using photovoltaic panels.

The proposed project would entail the development of a Photovoltaic (PV) solar power plant up to 256 hectares in extent with a generation capacity of approximately 100MWp (80 MWac) covering the entire feasible area. The final capacity would be dependent on ongoing development of photovoltaic technologies, as more efficient modules may become available by the time that the project would begin construction. The development footprint is approximately 256 hectares; however the generation capacity may vary based on the availability of more efficient PV panels.

1.2 Terms of reference and scope of work

Undertake a Heritage Impact Assessment and submit a specialist report, which addresses the following:

- A desktop and field assessment to gather information on heritage resources within the proposed development area;
- Identify possible archaeological, cultural and historic sites within the proposed development area;
- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance; and
- Identifying key uncertainties and risks.

2. PROJECT AND TERRAIN DISCRIPTION

2.1 Project location and description

The proposed project is located in the south-eastern portion of the farm Appelvlakte 448 LQ and is situated approximately 14 km north-west-west of the Lephale CBD. It falls within the quarter degree grid 2327 DA.

The solar facility will consist of:

- Solar PV panels,
- Steel support structure and tracker system on concrete foundations,
- Inverter stations as part of the PV field,
- Transformers, switchgear and related equipment as part of the Substations, and
- Internal roads.

The project associated infrastructure will consist of:

- Substation complex (33/132 kV) including control rooms and grid control yards,
- Existing Grootegeluk substation upgrades,
- 132 kV Transmission line and transmission towers,
- Battery Energy Storage System (BESS),
- Operations and maintenance buildings,
- Water provision,
- Access roads,
- Internal roads,
- Perimeter fencing,
- Access control gate,
- Security building,
- Temporary concrete batching facility,
- Temporary offices for the construction period,
- Construction yard, and
- Laydown area

The Lephale Solar facility is being developed with a maximum installed capacity of 100 MWp (DC) which produces 80 MWac (AC) of electricity. The facility will be in operation for at least 20 years. It is important to note that the final specifications of the project components will be determined during the detailed engineering phase which would commence after receipt of an Environmental Authority from the competent authority.

2.2 Terrain description

The study area is situated on the plains between the Waterberg and the Limpopo River. The topography is gentle and slopes toward the Mokolo River. There are no drainage lines within the project area and no erosion occurs. The yellow sandy soil appears to be deep as can be deduced from animal burrowing pits. There is no or very limited human impact on the terrain. No outcrops or rock formations exist in the project area.

The entire terrain consists of dense natural vegetation of the Limpopo Sweet Bushveld short open woodland type. Common trees are Rooibos (*Combretum apiculatum*), Vaalboom (*Terminalia sericea*), Maroela (*Sclerocarya birrea*), Red syringa (*Burkea Africana*), Camel thorn (*Vachelia erioloba*) and the occasional Sickie bush (*Dichrostachys*).

3. RELEVANT LEGISLATION

Two sets of legislation are relevant for this study with regard to the protection of heritage resources and graves.

3.1 The National Heritage Resources Act (25 of 1999) (NHRA)

This Act established the South African Heritage Resources Agency (SAHRA) and makes provision for the establishment of Provincial Heritage Resources Authorities (PHRA). The Act makes provision for the undertaking of heritage resources impact assessments for various categories of development as determined by Section 38. It also provides for the grading of heritage resources (Section 7) and the implementation of a three-tier level of responsibilities and functions for heritage resources to be undertaken by the State, Provincial authorities and Local authorities, depending on the grade of the Heritage resources (Section 8).

In terms of the National Heritage Resources Act (1999) the following is of relevance in terms of the general protection of heritage resources:

Historical remains

Section 34(1) No person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Archaeological remains

Section 35(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority or to the nearest local authority or museum, which must immediately notify such heritage resources authority.

Subsection 35(4) No person may, without a permit issued by the responsible heritage resources authority-

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.

Subsection 35(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may-

- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;

- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Subsection 35(6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or meteorite is situated; serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.

Burial grounds and graves

Subsection 36(3)

- (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority-
- (c) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (d) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in detection or recovery of metals.

Subsection 36(6) Subject to the provision of any law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South

African Police Service and in accordance with regulations of the responsible heritage resources authority-

(a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and

(b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the content of such grave or, in the absence of such person or community, make any such arrangement as it deems fit.

Culture Resource Management

Subsection 38(1) Subject to the provisions of subsection (7), (8) and (9), any person who intends to undertake a development* ...

must at the very earliest stages of initiating such development notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

***‘development’** 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-

(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;

(b) carry out any works on or over or under a place*;

(e) any change to the natural or existing condition or topography of land, and

(f) any removal or destruction of trees, or removal of vegetation or topsoil;

****‘place’** means a site, area or region, a building or other structure* ...”

****‘structure’** means any building, works, device or other facility made by people and which is fixed to the ground ...”

3.2 The Human Tissues Act (65 of 1983)

This Act protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the

exhumation and re-burial must be obtained from the relevant Provincial MEC, most the relevant Local Authorities.

4. METHODOLOGY

4.1 Sources of information

The main source of information was a literature review. In 2011 a similar project was investigated by Exxaro on the neighbouring farm Nelsonkop 464 LQ and the specialist studies for this project was very useful. A pedestrian reconnaissance of the proposed project area was undertaken and the SAHRIS database was consulted. Google Earth and the Topographical map 2327 DA were studied.

4.2 Limitations and assumptions

- There are no roads or paths on the terrain resulting in the area being traversed on foot along game tracks or blindly through the woodland by means of keeping track of movement on the GPS-map function on which the outer boundary was plotted.
- Visibility was good in the area of movement, but dense vegetation in places may have obscured evidence of heritage remains.
- It must be noted that most archaeological material is subterranean and may have been missed on the surface. Therefore chance finds may occur.
- Absence of evidence is not evidence of absence.

4.3 Categories of significance

The significance of heritage sites is ranked into the following categories.

No significance: sites that do not require mitigation.

Low significance: sites, which *may* require mitigation.

Medium significance: sites, which require mitigation.

High significance: sites, which must not be disturbed at all.

The significance of specifically an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage

Resources Act, 1999, while other historical and cultural significant sites, places and features, are often determined by community preferences.

4.4 Terminology

Early Stone Age: Predominantly the Oldowan artifacts and Acheulian hand axe industry complex dating to + 1Myr yrs – 250 000 yrs. before present.

Middle Stone Age: Various lithic industries in SA dating from ± 250 000 yrs. - 22 000 yrs. before present.

Late Stone Age: The period from ± 22 000-yr. to contact period with either Iron Age farmers or European colonists.

Early Iron Age: Most of the first millennium AD

Middle Iron Age: 10th to 13th centuries AD

Late Iron Age: 14th century to colonial period. *The entire Iron Age represents the spread of Bantu speaking peoples.*

Phase 1 assessments: Scoping surveys to establish the presence of and to evaluate heritage resources in a given area

Phase 2 assessments: In depth culture resources management studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling could be undertaken.

PIA Palaeontological Impact Assessment.

Sensitive: Often refers to graves and burial sites, as well as ideologically significant sites such as ritual / religious places. *Sensitive* may also refer to an entire landscape / area known for its significant heritage remains.

NHRA National Heritage Resources Act (Act 25 of 1999)

SAHRA South African Heritage Resources Agency

SAHRIS South African Heritage Resources Information System

5. BASELINE INFORMATION

No significant research had been conducted within the direct project area. The baseline information is therefore mostly generic.

5.1 The Stone Age

The Stone Age covers most of southern Africa and the earliest consist of the Oldowan and Acheul artifacts assemblages. Oldowan tools are regularly referred to as “choppers”. Oldowan artifacts are associated with *Homo habilis*, the first true humans. In South Africa definite occurrences have been found at the sites of Sterkfontein and Swartkrans. Here they are dated to between 1.7 and 2 million years old. Bearing in mind the proximity of the Makapans Valley palaeontological site about 50km south-east of the project area it is possible that they may occur here. This was followed by the Acheulian technology from about 1.4 million years ago which introduced a new level of complexity. The large tools that dominate the Acheulian artefact assemblages range in length from 100 to 200 mm or more. Collectively they are called bifaces because they are normally shaped by flaking on both faces. In plan view, they tend to be pear-shape and are broad relative to their thickness. Most bifaces are pointed and are classified as handaxes, but others have a wide cutting end and are termed cleavers. The Acheulian design persisted for more than a million years and only disappeared about 250 000 years ago. Here, too the Makapans Valley Site is referenced; especially the Cave of Hearths.

The change from Acheulian with their characteristic bifaces, handaxes and cleavers to Middle Stone Age (MSA), which are characterized by flake industries, occurred about 250 000 years ago and ended about 30 000 – 22 000 years ago. For the most part the MSA is associated with modern humans; *Homo sapiens*. MSA remains are found in open spaces where they are regularly exposed by erosion as well as in caves. Characteristics of the MSA are flake blanks in the 40 – 100 mm size range struck from prepared cores, the striking platforms of the flakes reveal one or more facets, indicating the preparation of the platform before flake removal (the prepared core technique), flakes show dorsal preparation – one or more ridges or arise down the length of the flake – as a result of previous removals from the core, flakes with convergent sides (laterals) and a pointed shape, and flakes with parallel laterals and a rectangular or quadrilateral shape: these can be termed pointed and flake blades respectively. Other flakes in MSA assemblages are irregular in form. The project area contains a thick calcrete layer below the prevailing surface sand. Mason (1962) has recorded MSA tools from below the calcrete on the farm

De Loskop 205 LS, approximately 30 km east of the project area. A similar situation may occur in the project area. In addition Mason also observed that MSA material occur next to or near pans – the project area contains a number of pans, especially in the south-eastern part.

The change from Middle Stone Age to Later Stone Age (LSA) took place in most parts of southern Africa little more than about 20 000 years ago. It is marked by a series of technological innovations or new tools that, initially at least, were used to do much the same jobs as had been done before, but in a different way. Their introduction was associated with changes in the nature of hunter-gatherer material culture. The innovations associated with the Later Stone Age “package” of tools include rock art – both paintings and engravings, smaller stone tools, so small that the formal tools less than 25mm long are called microliths (sometimes found in the final MSA) and Bows and arrows. Rock art is an important feature of the LSA and is abundant in the Waterberg Mountains.

Surveys of adjacent areas determined that Middle Stone Age remains are present at pans, usually where the calcrete base was exposed as well as in isolated settings. This calcrete formed during a cold period with alternating wet and dry episodes that allowed calcium carbonate to precipitate on to the land surface. Some Middle Stone Age (MSA) artifacts occurred in the calcrete, and so they predate this geo-morphological formation. These artefact assemblages typically include radial cores, triangular points, convergent scrapers and flakes. They represent what is called a Post Howieson’s Poort Industry and thus date to between 60,000 and 40,000 years ago (see Deacon and Deacon 1999: 96-98). These Post Howieson’s Poort artifacts were made from quartz and quartzite pebbles that formed part of the fericrete horizon found underneath the calcrete. This fericrete is an iron-rich formation derived from the Waterberg sandstones to the south. The stones and iron-rich soil must have first washed down during a high-rainfall period and then formed under arid conditions, perhaps about 200,000 years ago. If Early Stone Age artifacts occur in the study area, they will lie under this fericrete horizon (Huffman & van der Walt 2013).

A Late Stone Age archaeological site was identified on a koppie named Koorn Kop on the adjacent farm Nelsonkop 464 LQ. Some engravings of animal spoors, cupules, and cut marks were identified on the southern face of the koppie (van Schalkwyk 2011).

The proposed project does not impact on any rock formation or large boulders where rock art paintings or engravings may occur.

5.2 The Iron Age (Early Farming Communities)

According to the archaeological cultural distribution sequences by Huffman (2007), this area falls within the distribution area of various cultural groupings originating out of both the Urewe Tradition (eastern stream of migration) and the Kalundu Tradition (western stream of migration). The ceramic facies that may be present are:

Urewe Tradition:	Moloko branch	Letsibogo facies AD 1500 – 1700 (Late Iron Age) Madikwe facies AD 1500 – 1700 (Late Iron Age) <i>This is an area where the Letsibogo and Madikwe facies may overlap. Both are associated with Sotho-Tswana speakers.</i>
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Kalundu Tradition:	Benfica sub-branch Happy Rest sub-branch	Bambata facies AD 150 – 650 (Early Iron Age) Diamand facies AD 750 - 1000 (Early Iron Age) Eilandfacies AD 1000 – 1300 (Middle Iron Age)
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Although no Iron Age sites were observed in the project area, previous surveys to the west of the project area indicate that the area contains cattle outposts of farming communities living elsewhere.

5.3 The historical landscape

The historic period starts quite late in this part of the country. Probably one of the earliest published sources that refer to the area, in a generalised sense, is that of the explorer Thomas Baines who passed through the area during the early 1870s. Although for other sections of his travels he gives detailed descriptions of the local population, he does not comment on anybody in this particular area. Although his rendering of the various rivers

and other topographical features are quite accurate for the time, he seems to imply that there were no communities settled here.

Limited information has been obtained about some farms in the area. It seems as if they are part of government land until the early part of the 20th century and most were only surveyed in the period 1909 - 1910. Drilling activities undertaken by the "Irrigation Department" in 1920, apparently revealed more than water and the presence of coal and oil bearing shale was detected on the farms Grootegeluk and Hooikraal. This prompted an individual by the name of F.F. Pienaar to peg 50 claims on each of the farms Kringatspruit, Hooikraal, Grootegeluk, and Enkelbult (van Schalkwyk 2011).

6. RESULTS OF THE SURVEY

6.1 Palaeontology

The farm Applevlakte falls in the yellow/orange colour code of the SAHRIS Palaeontological Sensitivity Map. A separate palaeontological study will be prepared for the client.

6.2 Stone Age remains

No Stone Age material was detected in the study area. Bearing in mind the discussion in point 5, Baseline Information, Stone Age material may occur as chance finds or exposed during earthworks. However, no primary Stone Age site is expected.

The study terrain is not suitable for Rock Art as there are no large loose-standing boulders or rock overhangs which would facilitate rock art.

6.3 Late Iron Age (Early Farming Communities)

No Iron Age (Farming communities) cultural material was detected in the project area..

6.4 Graves and burials sites

No graves or burial sites were detected in the project area. Various burial sites and graves were, however, recorded to the south-west at Medupi Power Station by Mbofho Consulting and Project Managers during a community remedial process (Mbofho 2015). The proposed project will have no impact on community graves.

6.5 The built environment / historical structures

No historical structures or farmstead was detected in the project area.

7. DISCUSSION

The project area contains no know heritage resources. This is mainly due to the fact that the area is arid with no reliable water sources. People preferred to live near perennial water sources or springs, but would have utilised the area to collect resources and for livestock herding. Hunter-gatherers would have utilised seasonal pans. There is a risk that Stone Age material is likely to occur subterraneous, but that will only be exposed when earthworks commences.

8. EVALUATION AND STATEMENT OF SIGNIFICANCE

8.1 Significance criteria in terms of Section 3(3) of the National Heritage Resources Act.

Table 1: Significance criteria and rating

Significance		Rating
1.	The importance of the cultural heritage in the community or pattern of South Africa's history (Historic and political significance)	Low
2.	Possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage (Scientific significance).	Low
3.	Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage (Research/scientific significance)	Low
4.	Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects (Scientific significance)	None
5.	Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group (Aesthetic significance)	None
6.	Importance in demonstrating a high degree of creative or technical achievement at a particular period (Scientific significance)	None
7.	Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (Social significance)	Low
8.	Strong or special association with the life and work of a person, group or organization of importance in the history of South Africa (Historic significance)	None
9.	The significance of the site relating to the history of slavery in South Africa.	None

8.2 Section 38(3) (c) An assessment of the impact of the development on such heritage resources.

There will be no impact on known heritage resources.

8.3 Section 38(3) (d) An evaluation of the impact of the development on heritage resources relative to the sustainable economic benefits to be derived from the development.

The sustainable economic benefits outweigh the significance of the heritage resources for local community development.

8.4 Section 38(3) (e) *The results of consultation with the communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources.*

The development will have no direct impact on local communities.

8.5 Section 38(3)(f) *If heritage resources will be adversely affected by the proposed development the consideration of alternatives.*

From a heritage management perspective there is no need to consider alternatives.

8.6 Section 38(3)(g) *Plans for mitigation of any adverse effects during and after the completion of the proposed development.*

No specific mitigation measures are recommended.

9. RECOMMENDATIONS

In view of the above it is only recommended that;

- The environmental control officer must be made aware of the fact that Stone Age material may be exposed during earthworks and that an archaeologist must be consulted for an assessment and further action.

From a heritage resources management perspective, there is no reason why the development may not proceed.

10. REFERENCES

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Van Schalkwyk, JA. 2011. Heritage impact assessment report for the Proposed Establishment of the Exxaro PV Plant on the Farm Nelsonskop, North-West of Lephalale, Limpopo Province. Unpublished report.

11. MAPS AND IMAGES (Figures 1 – 6)



Figure 1. Google earth image showing the project area in relation to Lephalale and nearby Power Stations and Mine.



Figure 2. Google earth image of project area with GPS track indicated by the yellow line.



Figure 3. General view of the vegetation.



Figure 4. View of animal burrow.



Figure 5. View of game trail.



Figure 6. View of high voltage power line just east of the project area.

APPENDIX B
PIA DESKTOP STUDY

**DESKTOP PALEONTOLOGICAL ASSESSMENT FOR A PROPOSED
GROOTGELUK PHOTOVOLTAIC POWER STATION NEAR LEPHALALE,
LIMPOPO PROVINCE**

FOR

**UMLANDO: Archaeological Surveys & Heritage Management
PO Box 102532, Meerensee, KwaZulu-Natal 3901
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By

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Telephone: 031 208 6896
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4 June 2021

Declaration of Independence

This report has been compiled by Dr Alan Smith (Pr. Sc. Nat.) of Alan Smith Consulting, Durban. The views expressed in this report are entirely those of the author, if not then the source has been duly acknowledged. No other interest was displayed during the decision making process for the Project.

Specialist: Dr Alan Smith

Signature:

A handwritten signature in black ink, appearing to be 'AS', written over a horizontal line.

EXECUTIVE SUMMARY

*Alan Smith Consulting was appointed by Umlando to conduct a desk-top assessment of the potential impacts to **Palaeontology Resources** that might occur through the proposed development of a Photovoltaic Power Station, near Lephalale, Limpopo Province. This project is to be constructed on Clarence Formation rocks. This is zoned orange by Sahris but the footprint will be very shallow and significant palaeontological material is unlikely to be found.*

Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), requires a Palaeontological Impact Assessment (PIA) to assess any potential impacts to palaeontological heritage.

*The chances of encountering fossils is **Low**, but a “**Chance Find Protocol**” has been included. Should fossils be found then a suitably qualified palaeontologist should be called in to undertake an analyses.*

ACRONYMS

BA:	Basic Assessment
EDTEA:	(Department of) Economic Development, Tourism and Environmental Affairs
HIA:	Heritage Impact Assessment
PIA;	Palaeontological Impact Assessment
SAHRA:	South African Heritage Resource Agency
SAHRIS:	South African Heritage Resources Information System

1. BACKGROUND

It is proposed that a Photovoltaic Power Station be erected at Grootgeluk, near Lephale, Limpopo (**Fig.1**). These features have a wide footprint but a very shallow foundation, consequently there is very little disturbance of the soil or rock.



Figure 1: Location map of Proposed Grootgeluk Photovoltaic Power Station Project (white polygon).

2. TERMS OF REFERENCE

Alan Smith Consulting was requested by UMLANDO: Archaeological Surveys & Heritage Management to provide a Desk-Top Palaeo Impact Assessment for the proposed Photovoltaic Power Station near Belfast (**Fig.1**). The work was to be based on the knowledge gained from desktop review. This report is to meet the requirements of the National Environmental Management Act (Act 107 of 1998) [as amended] Environmental Impact Assessment (EIA) regulations, Appendix 6.

3. SCOPE AND PURPOSE OF REPORT

A Palaeontological Impact Assessment (PIA) is a means of identifying any significant palaeontological material before development begins, so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. The Desk-Top PIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation, should this be granted.

4. METHODOLOGY

Geological maps, a literature review and personal experience were used in this research.

5. GEOLOGY

Clarence Formation

This site is underlain by Clarence Formation (**Fig. 2**) which is part of the Karoo Sequence. The Lower Jurassic aged Clarence Formation comprises predominantly fine-medium-grained sandstone and forms spectacular cliffs. The Formation is interpreted as an Aeolian deposit (desert dunes). This was a continent-scale desert. The average thickness of the Clarence Formation in the Ellisras/Lephale Basin is 80 m with a maximum thickness of 130 m (Bordy and Head, 2018).

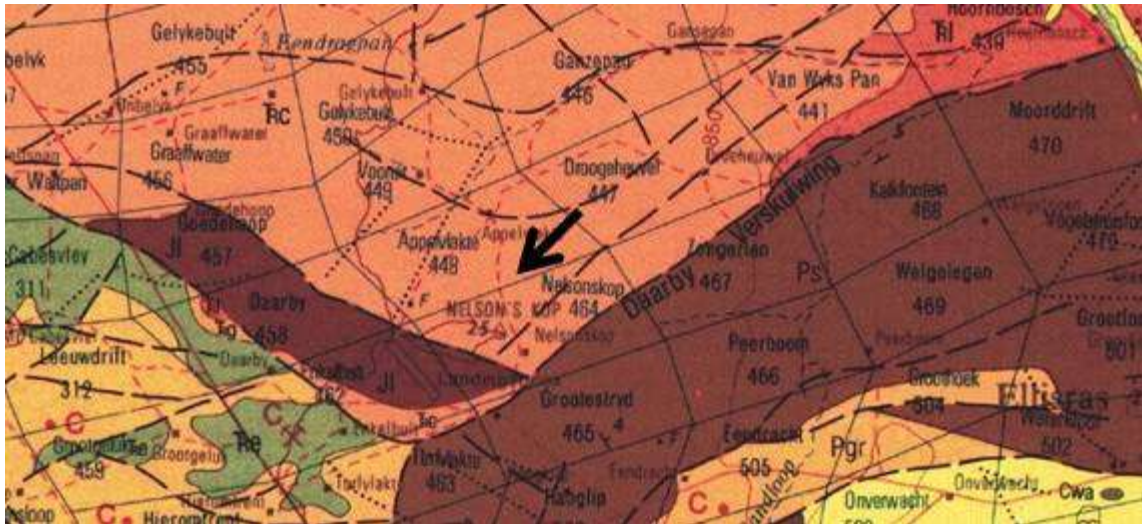


Figure 2: Extract from the Ellisras 2326 1:250 000 Geological map. According to this map, the proposed site is underlain by Clarence Formation (arrow).

The propose project is within the Lephale/ Ellisras Basin, separate from that of the Main Karoo Basin (**Fig. 3**) No literature specific to this locality exists.

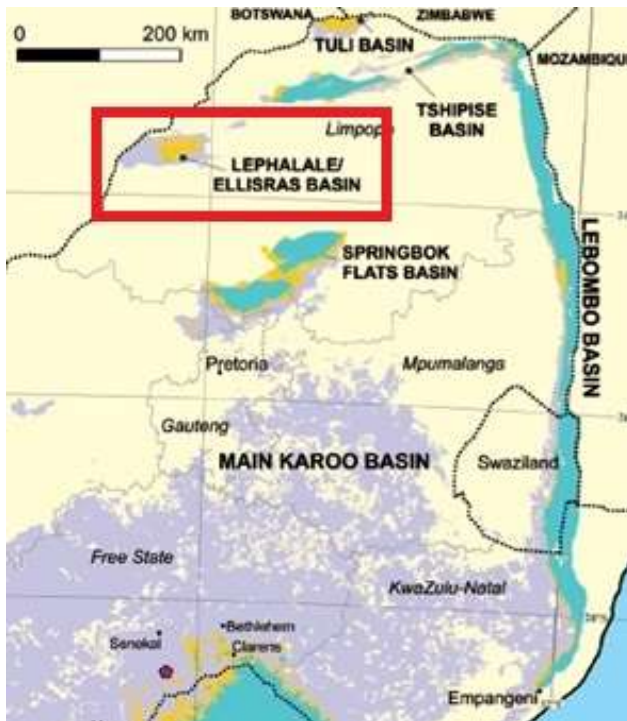


Figure3: Location of the Lephale/ Ellisras Basin (in red box). Image modified (after Bordy and Head (2018).

6. PALAEOLOGY

Clarence Formation

The SAHRIS Palaeosensitivity Map (Figure 4) considers the Clarence Formation as a **High Palaeosensitivity Zone**.

Within the Main Karoo Basin (**Fig. 3**), vertebrate and invertebrate fossils are generally found in the lower parts, of prominent cliffs (Bordy and Head, 2018). The proposed project locality is flat, and probably highly weathered, so is unlikely to be fossiliferous.

Very little is known about the Lephale/ Ellisras Basin (**Fig. 3**). According to Kitching and Raath (1984) vertebrate and invertebrate fossil occurrences in the Clarens Formation are mostly reported from its more accessible lower part, particularly near the base of the vertical cliffs. Systematic mapping of fossil distributions within the Clarens Formation has never been undertaken (Bordy and Head, 2018), this is particularly true of the Lephale/ Ellisras Basin.



Figure 4: Palaeosensitivity of the Grootgeluk Photovoltaic Power Station site. This is indicated in red.

Table 1: Summary of SAHRIS categories

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required

This project will have a very shallow foundation, consequently there will be very little disturbance to any palaeontological material. However a “Chance Find Protocol” has been included.

7. SUMMARY

The chance of significant fossils being found on this site is **Low**, but not **Zero**. **Consequently a “Chance Find Protocol”** has been included to cover this eventuality. No further palaeontological work is required, unless triggered by the “**Chance Find Protocol**”, which must form part of the Environmental Management Programme (EMPr) for the site. Should palaeontological material be found, a suitably qualified palaeontologist must inspect the find.

8. CHANCE FIND PROTOCOL

This Chance Find Protocol must be included in the site EMPr.

If any fossils are found, a Palaeontologist must be notified immediately by the ECO and/or EAP and a site visit must be arranged at the earliest possible time with the Palaeontologist.

In the case of the ECO or the Site Manager becoming aware of suspicious looking palaeo-material:

- The construction must be halted in that specific area and the Palaeontologist must be given enough time to reach the site and remove the material before excavation continues.
- Mitigation will involve the attempt to capture all rare fossils and systematic collection of all fossils discovered. This will take place in conjunction with descriptive, diagrammatic and photographic recording of exposures, also involving sediment samples and samples of both representative and unusual sedimentary or biogenic features. The fossils and contextual samples will be processed (sorted, sub-sampled, labeled, and boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

Functional responsibilities of the Developer

1. At full cost to the project, and guided by the appointed Palaeontological Specialist, ensure that a representative archive of palaeontological samples and other records is assembled to characterize the palaeontological occurrences affected by the excavation operation.
2. Provide field aid, if necessary, in the supply of materials, labour and machinery to excavate, load and transport sampled material from the excavation areas to the sorting areas, removal of overburden if necessary, and the return of discarded material to the disposal areas.
3. Facilitate systematic recording of the stratigraphic and palaeo-environmental features in exposures in the fossil-bearing excavations, by described and measured geological sections, and by providing aid in the surveying of positions where significant fossils are found.
4. Provide safe storage for fossil material found routinely during excavation operations by construction personnel. In this context, isolated fossil finds in disturbed material qualify as “normal” fossil finds.
5. Provide covered, dry storage for samples and facilities for a work area for sorting, labeling and boxing/bagging samples.

6. Costs of basic curation and storage until collected. Documentary record of palaeontological occurrences must be done.

7. The contractor will, in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which appropriate information regarding plans for excavations and work schedules must be indicated on the plan of the excavation sites. This must be done in conjunction with the appointed specialist.

8. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.

9. Locations of samples and measured sections are to be pegged, and routinely and accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any "significant fossils" are recorded during the time of excavation.

9, CONCLUSIONS

This project will be constructed within soil formed from the Umkwalene Formation, and possibly the Vryheid Formation. Although paleontological material is unlikely to be encountered in the soil, a “Chance Find Protocol” has been included. No further **palaeontological work** is required unless the “Chance Find Protocol” is triggered.

10. REFERENCES

Bordy, EM and Head, HV., 2018, Lithostratigraphy of the Clarens Formation (Stormberg Group, Karoo Supergroup), South Africa. South African Journal of Geology, 121.1, 119-130

Ellisras 2326: 1: 250 000 Geological Map. Council for Geosciences, Pretoria.

Kitching, J.W. and Raath, M.A., 1984. Fossils from the Elliot and Clarens Formations (Karoo Sequence) of the northeastern Cape, Orange Free State and Lesotho, and a suggested biozonation based on tetrapods. Palaeontologia africana, 25, 111-125.

Sahris Palaeosensitivity Map: <https://sahris.sahra.org.za/map/palaeo>

11. DETAILS OF SPECIALIST

Dr Alan Smith

Private Consultant: *Alan Smith Consulting, 29 Brown's Grove, Sherwood, Durban, 4091*
&

Honorary Research Fellow: *Discipline of Geology, School of Agriculture, Earth and Environmental Sciences, University of KwaZulu-Natal, Durban.*

Role: Specialist Palaeontological Report production

Expertise of the specialist:

- PhD in Geology (University of KwaZulu-Natal), Pr. Sc. Nat., I.A.H.S.
- Expert in Vryheid Formation (Ecca Group) in northern KZN, this having been the subject of PhD.
- Scientific Research experience includes: Fluvial geomorphology, palaeoflood hydrology, Cretaceous deposits.
- Experience includes understanding Earth Surface Processes in both fluvial and coastal environments (modern & ancient).
- Alan has published in both national and international, peer-reviewed journals. He has published + 50 journal articles with 497 citations (detailed CV available on request).
- Attended and presented scientific papers and posters at numerous international and local conferences (UK, Canada, South Africa) and is actively involved in research.

Selected recent palaeo-related work includes:

- Desktop PIA: Proposed middle income housing units on Portion 23 of Farm Lot H Weston 13026, Bruntville, Mpofana Local Municipality. Client: UMLANDO.
- Desktop PIA: Proposed ByPass Pipeline for Ulundi bulk water pipeline upgrade. Client: UMLANDO.
- Fieldwork PIA: Bhekuzulu Epangweni KZN water reticulation project, Cathkin Park. Client: Mike Webster, HSG Attorneys.
- Fieldwork PIA: Mpungoze water supply scheme, Empangeni. Client: Enviropro.
- Fieldwork PIA: Helpmekaar Dam. Client: Afzelia environmental consultants.
- Desktop PIA: Zuka valley, Ballito. Client: Mike Webster, HSG Attorneys.
- Mevamhlope proposed quarry palaeontology report. Client: Enviropro.
- Desktop PIA: Proposed Lovu Desalination site. Client: eThembeni Cultural Heritage.
- Desktop PIA: Tinley Manor phase 2 North & South banks: eThembeni Cultural Heritage
- Desktop PIA: Tongaat. Client: eThembeni Cultural Heritage.
- Palaeontological Assessment Reports (3) to Scatec Solar SA (Pty) Ltd on an Appraisal of Inferred Palaeontological Sensitivity for a Potential Photo Voltaic Park at (1) Farm Rooilyf near Groblersshoop, N Cape; (2) Farm Riet Fountain No. Portions 1 and 6, 18km SE of De Aar, N Cape; and (3) Dreunberg, near Burgersdorp, Eastern Cape. Client: Sustainable Development Projects.