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**ALBEBARAN SA (PTY) LTD: PROPOSED PHOTOVOLTAIC  
POWER PLANT DEVELOPMENT ON PORTION 40 OF THE  
FARM EENDUIN, KAI GARIB LOCAL MUNICIPALITY, SIYANDA  
DISTRICT MUNICIPALITY NORTHERN CAPE PROVINCE**

**Archaeological Impact Assessment**



Prepared for: **Albebaran SA (Pty) Ltd.**

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## **ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) OF AREAS DEMARCTED FOR THE PROPOSED PHOTOVOLTAIC POWER PLANT (EENDUIN SOLAR PARK, ACCESS ROADS AND POWER LINE), KAI GARIB LOCAL MUNICIPALITY, SIYANDA DISTRICT MUNICIPALITY NORTHERN CAPE PROVINCE**

**February 2015**

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**DECLARATION**

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I, Nelius Le Roux Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Eenduin Solar Park, access roads and power line Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, AMAFA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.



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Signature of specialist

**Company:** Exigo Sustainability

**Date:** 22 February 2015

## EXECUTIVE SUMMARY

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This report details the results of an Archaeological Impact Assessment (AIA) study on a part of Portion 40 of the farm Eenduin west of the town of Keimoes, subject to an Environmental Impact Assessment (EIA) process for the proposed Eenduin Solar Park, access roads and power line Project in the //Khara Hais Local Municipality Siyanda District Municipality, Northern Cape Province. The proposed project includes the construction of a PV power plant covering a footprint of up to **210ha**, an access road measuring approximately **3.5km** and power line connections within the proposed solar park footprint. The report includes background information on the area's archaeology, its representation in southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

A small number of archaeological studies have been conducted in the Keimoes area but these studies all infer a varied and rich heritage landscape. Even though the landscape of this section of the Northern Cape seems to have been relatively sparsely populated by humans in the past, Middle Stone Age (MSA) and Later Stone Age (LSA) scatters and quarries occur frequently in low lying areas on plains between dune straights and outcrops along the Orange River. Similarly, a number of MSA occurrences were noted during the site survey, at a number of localities, some of which near drainage channels and in association with exposed decomposing calcrete deposits.

### **Stone Age:**

- During this study it was found that cultural material in this landscape occurs in lower lying areas near sources of water and in association with exposed decomposing calcrete horizons. Single MSA lithics (specifically a broken point, a retouched side scraper and a flake tool) were noted along the southern portion of the proposed access road route to the N14 (marked as **EXIGO-EDP40-SA01**). The access road alignment follows an existing gravel road for the largest part and this area has also been adversely altered and disturbed, and the occurrence is of low heritage value due to the loss of artefact context and the low density of the lithic occurrence. A number of low density MSA lithic occurrences (adzes, scrapers, blades, points and worked chunks and flakes) were identified scattered across the proposed Solar Park footprint area (marked as **EXIGO-EDP40-SA02 - EXIGO-EDP40-SA12**). Most of the occurrences are randomly located across the area where precipitation and groundwater have exposed the stone tools but in some instances lithics appear within a decomposed calcrete rock layer in association with quartzite deposits. The stone implements comprise isolated occurrences that are spread thinly and unevenly over the surrounding landscape. Generally, the occurrences are lacking in context as no organic remains such as bone, pottery or ostrich eggshell was found. The fairly small numbers and isolated context in which they were found means that these archaeological remains have been rated as having low archaeological significance. However, the occurrence of these stone tools strongly suggests that similar sites could be located elsewhere in the study area, potentially sub-surface. This is due to the area's close proximity to the Orange River which renders it is prone to alluvial deposits that could burry potential Stone Age material. It is therefore recommended that a Stone Age archaeologist familiar with the archaeological sequence of the area conduct at least one site inspection during construction phases of the proposed development in order to monitor possible impacts on previously undetected Stone Age receptors in the area. In addition, it is recommended that a careful watching brief monitoring process be implemented whereby an informed ECO inspect

the construction sites on regular basis in order to monitor possible impact on previously undetected heritage resources. Should any subsurface paleontological, archaeological or historical material or heritage resources be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

A Palaeontological Impact Assessment and / or Desktop Study is recommended for the study area and, should fossil remains such as fossil fish, reptiles or petrified wood be exposed during construction, these objects should carefully safeguarded and the relevant heritage resources authority (SAHRA) should be notified immediately so that the appropriate action can be taken by a professional palaeontologist.

**Eenduin Solar Park Project low density MSA occurrences locations:**

Waypoint Code	Coordinate S	Coordinate E
EXIGO-EDP40-SA01	S28.70490°	E20.89387°
EXIGO-EDP40-SA02	S28.68494°	E20.87456°
EXIGO-EDP40-SA03	S28.68530°	E20.87766°
EXIGO-EDP40-SA04	S28.68632°	E20.88338°
EXIGO-EDP40-SA05	S28.68240°	E20.88117°
EXIGO-EDP40-SA06	S28.68319°	E20.87523°
EXIGO-EDP40-SA07	S28.68072°	E20.87942°
EXIGO-EDP40-SA08	S28.67710°	E20.87638°
EXIGO-EDP40-SA09	S28.67881°	E20.87130°
EXIGO-EDP40-SA10	S28.67799°	E20.87396°
EXIGO-EDP40-SA11	S28.67428°	E20.87325°
EXIGO-EDP40-SA12	S28.67058°	E20.87276°

*Heritage resources of low significance have been documented in the Eenduin Photovoltaic Power Plant footprint areas. However, it is the opinion of the author of this Archaeological Impact Assessment Report that the proposed Eenduin Solar Park, access roads and power line Project on portion 40 of the farm Eenduin will have a very limited impact on archaeological heritage resources. The author is confident that the study has captured adequate information on the archaeological heritage present. The project should be allowed to proceed from a culture resources management perspective, provided that mitigation measures provided in this assessment (monitoring), endorsed by the relevant Heritage Resources authority, are implemented where applicable.*

It is essential that cognisance be taken of the larger archaeological landscape of the Northern Cape Province and the Keimoes region in order to avoid the destruction of previously undetected heritage sites. Should any previously undetected heritage resources be exposed or uncovered during construction phases of the proposed project, these should immediately be reported to SAHRA. Since the intrinsic heritage and social value of graves and cemeteries are highly significant, these resources require special management measures. Should human remains be discovered at any stage, these should be reported to the Heritage Specialist and relevant authorities (SAHRA) and development activities should be suspended until the site has been inspected by the Specialist. The Specialist will advise on further management actions and possible relocation of human remains

in accordance with the Human Tissue Act (Act 65 of 1983 as amended), the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), the National Heritage Resources Act (Act no. 25 of 1999) and any local and regional provisions, laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials.

This report details the methodology, limitations and recommendations relevant to these heritage areas, as well as areas of proposed development. It should be noted that recommendations and possible mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).

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## NOTATIONS AND TERMS/TERMINOLOGY

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**Absolute dating:**

Absolute dating provides specific dates or range of dates expressed in years.

**Archaeology:**

The study of the human past through its material remains.

**Archaeological record:**

The archaeological record minimally includes all the material remains documented by archaeologists. More comprehensive definitions also include the record of culture history and everything written about the past by archaeologists.

**Artefact:**

Entities whose characteristics result or partially result from human activity. The shape and other characteristics of the artefact are not altered by removal of the surroundings in which they are discovered. In the southern African context examples of artefacts include potsherds, iron objects, stone tools, beads and hut remains.

**Assemblage:**

A group of artefacts recurring together at a particular time and place, and representing the sum of human activities.

**<sup>14</sup>C or radiocarbon dating:**

The <sup>14</sup>C method determines the absolute age of organic material by studying the radioactivity of carbon. It is reliable for objects not older than 70 000 years by means of isotopic enrichment. The method becomes increasingly inaccurate for samples younger than ±250 years.

**Ceramic Facies:**

In terms of the cultural representation of ceramics, a facies is denoted by a specific branch of a larger ceramic tradition. A number of ceramic facies thus constitute a ceramic tradition.

**Ceramic Tradition:**

In terms of the cultural representation of ceramics, a series of ceramic units constitutes as ceramic tradition.

**Context:**

An artefact's context usually consists of its immediate *matrix*, its *provenience* and its *association* with other artefacts. When found in *primary context*, the original artefact or structure was undisturbed by natural or human factors until excavation and if in *secondary context*, disturbance or displacement by later ecological action or human activities occurred.

**Culture:**

A contested term, "culture" could minimally be defined as the learned and shared things that people have, do and think.

**Cultural Heritage Resource:**

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

**Cultural landscape:**

A cultural landscape refers to a distinctive geographic area with cultural significance.

**Cultural Resource Management (CRM):**

A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

**Ecofact:**

Non artefactual material remains that has cultural relevance which provides information about past human activities. Examples would include remains or evidence of domesticated animals or plant species.



**Excavation:**

The principal method of data acquisition in archaeology, involving the systematic uncovering of archaeological remains through the removal of the deposits of soil and the other material covering and accompanying it.

**Feature:**

Non-portable artefacts, in other words artefacts that cannot be removed from their surroundings without destroying or altering their original form. Hearths, roads, and storage pits are examples of archaeological features

**GIS:**

Geographic Information Systems are computer software that allows layering of various types of data to produce complex maps; useful for predicting site location and for representing the analysis of collected data within sites and across regions.

**Historical archaeology:**

Primarily that aspect of archaeology which is complementary to history based on the study of written sources. In the South African context it concerns the recovery and interpretation of relics left in the ground in the course of Europe's discovery of South Africa, as well as the movements of the indigenous groups during, and after the "Great Scattering" of Bantu-speaking groups – known as the *mfecane* or *difaqane*.

**Impact:** A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

**Iron Age:**

Also known as "Farmer Period", the "Iron Age" is an archaeological term used to define a period associated with domesticated livestock and grains, metal working and ceramic manufacture.

**Lithic:**

Stone tools or waste from stone tool manufacturing found on archaeological sites.

**Management / Management Actions:**

Actions – including planning and design changes - that enhance benefits associated with a proposed development, or that avoid, mitigate, restore, rehabilitate or compensate for the negative impacts.

**Matrix:**

The material in which an artefact is situated (sediments such as sand, ashy soil, mud, water, etcetera). The matrix may be of natural origin or human-made.

**Megalith:**

A large stone, often found in association with others and forming an alignment or monument, such as large stone statues.

**Midden:**

Refuse that accumulates in a concentrated heap.

**Microlith:**

A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.

**Monolith:**

A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.

**Oral Histories:**

The historical narratives, stories and traditions passed from generation to generation by word of mouth.

**Phase 1 CRM Assessment:**

An Impact Assessment which identifies archaeological and heritage sites, assesses their significance and comments on the impact of a given development on the sites. Recommendations for site mitigation or conservation are also made during this phase.

**Phase 2 CRM Study:**

In-depth 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 is required. Mitigation / Rescue involves planning the protection of significant sites or sampling through excavation or collection (in terms of a permit) at sites that may be lost as a result of a given development.

**Phase 3 CRM Measure:**

A Heritage Site Management Plan (for heritage conservation), is required in rare cases where the site is so important that development will not be allowed and sometimes developers are encouraged to enhance the value of the sites retained on their properties with appropriate interpretive material or displays.

**Prehistoric archaeology:**

That aspect of archaeology which concerns itself with the development of humans and their culture before the invention of writing. In South Africa, prehistoric archaeology comprises the study of the Early Stone Age, the Middle Stone Age and the greater part of the Later Stone Age and the Iron Age.

**Probabilistic Sampling:**

A sampling strategy that is not biased by any person's judgment or opinion. Also known as statistical sampling, it includes systematic, random and stratified sampling strategies.

**Provenience**

Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association*, the co-occurrence of an artefact with other archaeological remains; and *superposition*, the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

**Random Sampling:**

A probabilistic sampling strategy whereby randomly selected sample blocks in an area are surveyed. These are fixed by drawing coordinates of the sample blocks from a table of random numbers.

**Relative dating:**

The process whereby the relative antiquity of sites and objects are determined by putting them in sequential order but not assigning specific dates.

**Remote Sensing:**

The small or large-scale acquisition of information of an object or phenomenon, by the use of either recording or real-time sensing device(s) that is not in physical or intimate contact with the object (such as by way of aircraft, spacecraft or satellite). Here, ground-based geophysical methods such as Ground Penetrating Radar and Magnetometry are often used for archaeological imaging.

**Rock Art Research:**

Rock art can be "decoded" in order to inform about cultural attributes of prehistoric societies, such as dress-code, hunting and food gathering, social behaviour, religious practice, gender issues and political issues.

**Scoping Assessment:**

The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

**Sensitive:**

Often refers to graves and burial sites although not necessarily a heritage place, 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.

**Site (Archaeological):**

A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity. These include surface sites, caves and rock shelters, larger open-air sites, sealed sites (deposits) and river deposits. Common functions of archaeological sites include living or habitation sites, kill sites, ceremonial sites, burial sites, trading, quarry, and art sites,

**Slag:**

The material residue of smelting processes from metalworking.

**Stone Age:**

An archaeological term used to define a period of stone tool use and manufacture.

**Stratigraphy:**

This principle examines and describes the observable layers of sediments and the arrangement of strata in deposits

**Stratified Sampling:**

A probabilistic sampling strategy whereby a study area is divided into appropriate zones – often based on the probable location of archaeological areas, after which each zone is sampled at random.

**Systematic Sampling:**

A probabilistic sampling strategy whereby a grid of sample blocks is set up over the survey area and each of these blocks is equally spaced and searched.

**Tradition:**

Artefact types, assemblages of tools, architectural styles, economic practices or art styles that last longer than a phase and even a horizon are describe by the term *tradition*. A common example of this is the early Iron Age tradition of Southern Africa that originated ± 200 AD and came to an end at about 900 AD.

**Trigger:** A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input. Legal requirements of existing and future legislation may also trigger the need for specialist involvement.

**Tuyère:**

A ceramic blow-tube used in the process of iron smelting / reduction.

**LIST OF ABBREVIATIONS**

<b>Abbreviation</b>	<b>Description</b>
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
CRM	Culture Resources Management
EC-PHRA	Eastern Cape Provincial Heritage Resources Agency
EIA	Early Iron Age (also Early Farmer Period)
EIA	Environmental Impact Assessment
EFP	Early Farmer Period (also Early Iron Age)
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
K2/Map	K2/Mapungubwe Period
LFP	Later Farmer Period (also Later Iron Age)
LIA	Later Iron Age (also Later Farmer Period)
LSA	Later Stone Age
MIA	Middle Iron Age (also Early later Farmer Period)
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)

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## 1 BACKGROUND

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### 1.1 Scope and Motivation

Exigo Sustainability was commissioned by Albebaran SA (Pty) Ltd. for an Archaeological Impact Assessment (AIA) study of a part of Portion 40 of the farm Eenduin, subject to an Environmental Impact Assessment (EIA) process for the proposed Eenduin Solar Park, access roads and power line, access road and power line in //Khara Hais Local Municipality, Siyanda District Municipality, Northern Cape Province. The rationale of this AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

### 1.2 Project Direction

Exigo Sustainability's expertise ensures that all projects be conducted to the highest international ethical and professional standards. As archaeological specialist for Exigo Sustainability, Mr Neels Kruger acted as field director for the project; responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA) as well as a Master's Degree candidate in archaeology at the University of Pretoria.

### 1.3 Project Brief

A Photovoltaic (PV) Power Plant, known as the Eenduin Solar Park is proposed on a part of Portion 40 of the farm Eenduin west of Keimoes (see Figure 1-1 and Figure 1-2). The purpose of the Eenduin Solar Park is to add new capacity for the generation of renewable electrical energy to the national electricity supply. The use of solar radiation for power generation is considered as a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions. With specific reference to photovoltaic energy and the proposed project, it is important to consider that South Africa has one of the highest levels of solar radiation in the world.

The PV power plant will cover a footprint (fenced area) **up to 210ha** within the study area, 1142ha in extent. This footprint includes development areas for the Solar Park as well as corridors demarcated for two new sections of 132kV power line. In addition, a **3500m** long access road link to the N14 is envisaged. The Eenduin solar facility will have a maximum generating capacity **up to 75 MW**. The facility will comprise several arrays (strings) of PV modules mounted on frames; the associated infrastructure and structures will consist of:

- **internal and external access roads and a small parking area;**
- fencing of the plant and video security control systems;
- foundations / mini piles for the mounted Photovoltaic arrays;
- electricity access point for the construction phase, operation phase (if necessary) and UPS (Uninterruptible Power Supply) devices;
- water access point and/or water extraction on-site from borehole(s), water supply pipelines, water treatment;



- sewage system and storm water collection system;
- workshop & warehouse,
- offices & administrative area;
- cabling linking Photovoltaic strings and other internal cabling;
- medium voltage stations designed to host DC/AC inverters and medium voltage power transformers;
- one medium voltage receiving station, linking in parallel all the medium voltage stations; (xii) one small on-site high-voltage substation with high-voltage power transformer(s),
- stepping up the voltage to the voltage of the Eskom's grid, control building(s) and one busbar with metering and protection devices (also called "switching station").

The PV plant will mainly consist of the following components:

- **Photovoltaic cells and photovoltaic modules:** PV cells are made in silicone and act as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic module. The facility will use photovoltaic modules with high efficiency.
- **Support structures:** PV modules will be assembled on steel or aluminium frames. At this stage, the preferred technology for the mounting system is **the horizontal single-axis trackers**, depicted in Figure 1. Each tracker is composed by several PV arrays North-South oriented and linked by a horizontal axis, driven by a motor. The horizontal axis allows the rotation of the PV arrays toward the West and East direction, in order to follow the daily sun path.
- **Strings and string boxes:** the PV modules are connected in series in order to form PV strings, so that the string voltage fits into the voltage range of the DC/AC inverters. PV strings are devised in order to be connected to DC-connection boxes (string boxes) with a parallel connection solution (PV sub-field). String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a general circuit breaker in order to disconnect the photovoltaic sub-fields from the DC/AC inverters.
- **Medium voltage stations:** Each medium-voltage station is designed to host one or more DC/AC inverters, and one or more medium-voltage power transformers. The DC/AC inverters are deemed to convert the direct current (DC) to alternating current (AC) at low voltage; subsequently the AC will pass through a medium-voltage power transformer in order to step-up the voltage up to 20/22 kV.
- **Medium-voltage receiving station:** The energy from the medium voltage stations will be collected into one medium voltage receiving station, linking in parallel all the PV fields of the PV generator.
- **High-voltage loop-in loop-out substation:** from the medium-voltage receiving station, the electrical energy will be delivered to one small on-site high-voltage substation with two or more high-voltage power transformers (one as spare), stepping up the voltage to the voltage of the Eskom grid.
- **Interventions on the Eskom's network:** the connection may also entail interventions in the "Oasis/Taaiput" 132 kV power line and/or on the Eskom network.

Other key features of the project are to ensure a high level of reliability, operational and maintenance safety, low water consumption. The expected operational life of the plant is deemed of approximately 25-30 years.

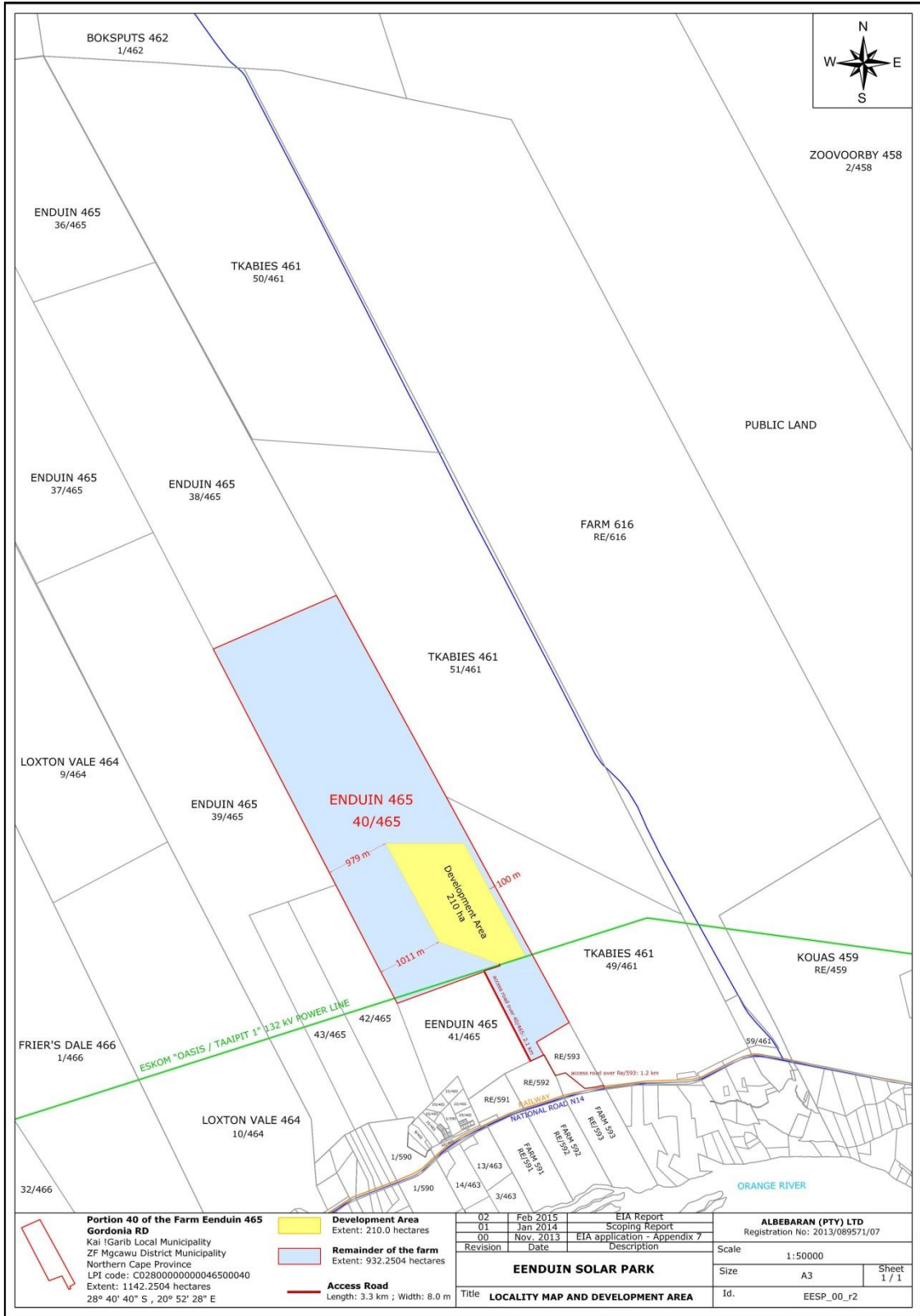


Figure 1-1: Map representation of the locality of the Eenduin Solar Park, access roads and power line project and infrastructure components.

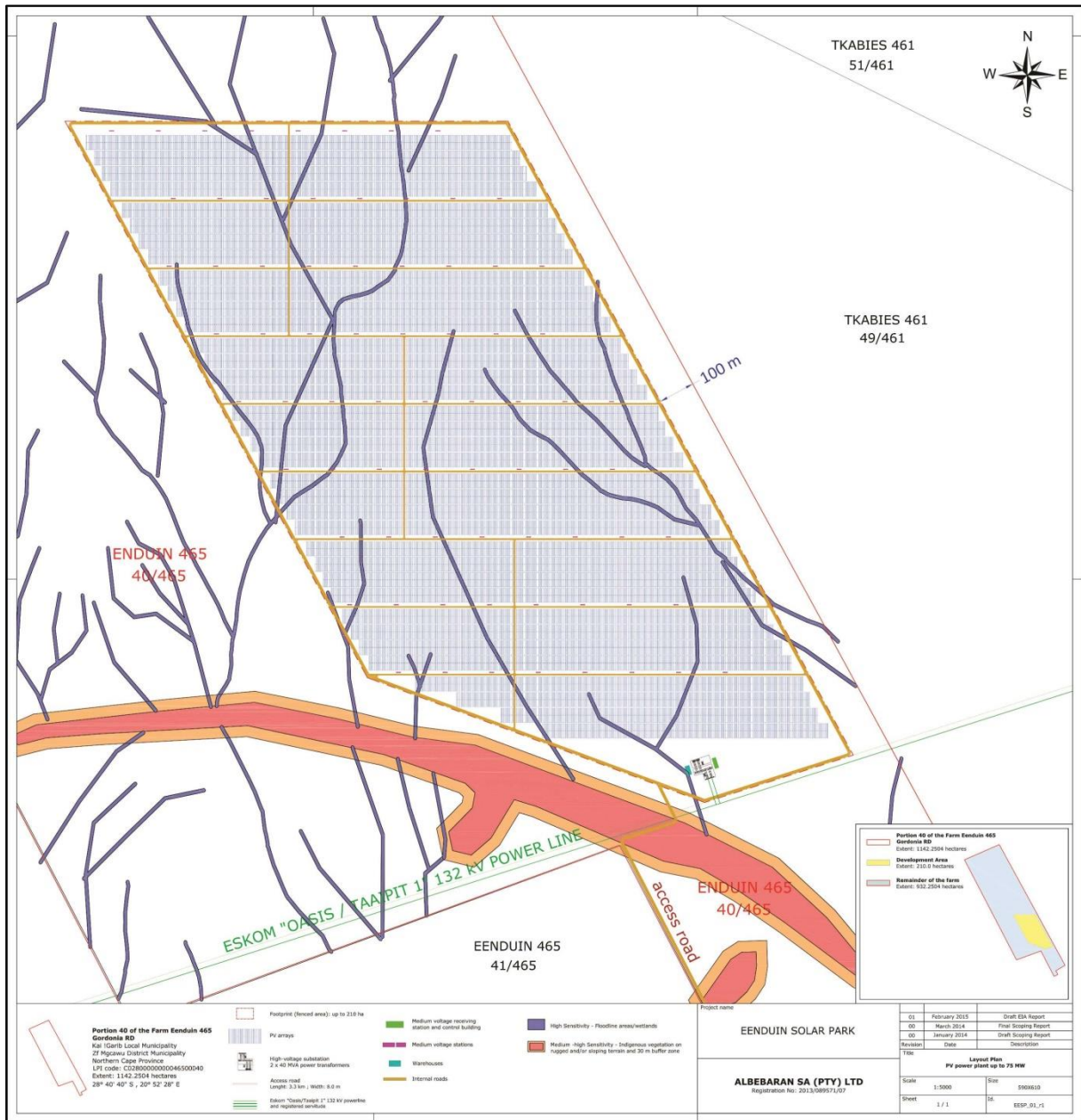


Figure 1-2: Map representation of the footprint proposed for the Eenduin Solar Park, access roads and power line.

#### 1.4 Terms of Reference

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that through the management of change, developments still conserve our heritage resources. Heritage specialist input in EIA processes can play a positive role in the development process by enriching an understanding of the past and its contribution to the present. It is also a legal requirement for certain development categories which may have an impact on heritage resources (Refer to Section 2.5.2).

Thus, EIAs should always include an assessment of Heritage Resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)** and the **KwaZulu-Natal Heritage Act (KZNHRA - Act of 2008)**. In addition, the NHRA and the KZNHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources. Based hereon, this project functioned according to the following **terms of reference** for heritage specialist input:

- *Provide detailed updated description of all additional archaeological artefacts, structures (including graves) and settlements which may be affected, if any.*
- *Assess the nature and degree of significance of such resources within the area.*
- *Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance.*
- *Assess any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.*
- *Propose possible heritage management measures provided that such action is necessitated by the development.*
- *Obtain a comment from the EC-PHRA.*

#### 1.5 CRM: Legislation, Conservation and Heritage Management

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

##### 1.5.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and their provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

###### a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known

as the “60-years clause”. Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. “Tell” refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects, meteorites and rare geological specimens
- visual art objects
- military objects
- numismatic objects
- objects of cultural and historical significance
- objects to which oral traditions are attached and which are associated with living heritage
- objects of scientific or technological interest
- any other prescribed category

With regards to activities and work on archaeological and heritage sites this Act states that:

*“No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority.” (34. [1] 1999:58)*

and

*“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 in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58).”*

and

*“No person may, without a permit issued by SAHRA or a provincial heritage resources agency-*

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;*

- (b) *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;*
- (c) *bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."*

**b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925**

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also 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 as well as the relevant Local Authorities.

**1.5.2 Background to HIA and AIA Studies**

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

**"38.** (1) *Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:*

- (a) *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- (b) *the construction of a bridge or similar structure exceeding 50m 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; or*
- (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,*

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

And:

*“The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:*

- (a) The identification and mapping of all heritage resources in the area affected;*
- (b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;*
- (c) an assessment of the impact of the development on such heritage resources;*
- (d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;*
- (e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;*
- (f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and*
- (g) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64).”*

**Consequently, section 35 of the Act requires Heritage Impact Assessments (HIAs) or Archaeological Impact Assessments (AIAs) to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects. Heritage resources management and conservation**

### **1.6 Assessing the Significance of Heritage Resources**

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities.

Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable*. Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

#### - Categories of significance

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of 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 generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

##### - *Aesthetic value:*

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

##### - *Historic value:*

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually a place has historical value because of some kind of influence by an event, person, phase or activity.

##### - *Scientific value:*

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

##### - *Social value:*

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group.

It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources; i.e. formally protected and generally protected sites:

#### **Formally protected sites:**

- Grade 1 or national heritage sites, which are managed by SAHRA



- Grade 2 or provincial heritage sites, which are managed by the provincial HRA (EC-PHRA).
- Grade 3 or local heritage sites.

**Generally protected sites:**

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 70 years.
- Structures older than 60 years.

With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally ranked into the following categories.

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, augering), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinterment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six 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),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

**A fundamental aspect in assessing the significance and protection status of a heritage resource is often whether or not the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and mitigated in order to gain data / information, which would otherwise be lost.**

## 2 REGIONAL CONTEXT

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### 2.1 Area Location

The study area is located on a section of Portion 40 of the farm Eenduin, located in the Kai Garib Local Municipality, Siyanda District Municipality, Northern Cape Province. The proposed project is situated approximately 10km west of the town of Keimoes with the footprint planned to the north of the Eskom "Oasis/Taaiput " 132 kV power line, generally at **S28.679522° E20.876009°** (see Figure 2-1). The study area occurs directly north of the of the N14 road connecting Keimoes to Kakamas. Eenduin appears on 1:50000 map sheet 2820DB (see Figure 2-1).

### 2.2 Area Description: Receiving Environment

The development site lies within the Nama Karoo biome which occurs on the central plateau and western half of South Africa, at altitudes between 500 and 2000 m, with most of the biome. The dominant vegetation is a grassy, dwarf shrubland. Grasses tend to be more common in depressions and on sandy soils, and less abundant on clayey soils. The geology underlying the biome is varied, as the distribution of the biome is determined primarily by rainfall. This also determines the predominant soil type with over 80% of the area covered by lime-rich weakly developed soil over rock (Low & Rebelo, 1996). The most recent classification of the area by Mucina & Rutherford (2006) shows that the site is classified as Bushmanland Arid Grassland. The landscape features of the Bushmanland Arid Grassland vegetation type are extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses<sup>1</sup>.

### 2.3 Site Description

The farm Eenduin is constituted out of slightly undulating plains on shallow calcareous soils. The site is very rocky and stony with sparse vegetation. The northern portion of the property is characterized by long grasses and deep red sands while the southern portion is less densely vegetated, and covered in mostly soft red sands and decomposing calcrete formations. As noted above, much of the terrain appears to consist of hard stony ground with little depth of soil while marked dunes and Kalahari sand surfaces occur to the northern side of the area under consideration. Several drainage channels (non-perennial streams) intersect the site and trend southwards towards the Orange River while there is a small hillock located towards the south-eastern border of the farm. The Eskom Oasis power line runs directly south of the proposed solar energy farm footprint. There is no other infrastructure on the proposed site. There are no old buildings, structures or features or any old equipment on the proposed site. The terrain consists of farmland, essentially grazing camps for cattle farming. A small quarry occurs in the southern extremity of the farm.

The chosen site is suitable for the installation of a photovoltaic (PV) power plant. It is appropriate morphologically (flat terrain) and regarding the favourable radiation conditions. The available radiation allows a high rate of electric energy production, as a combination of latitude-longitude and climatic conditions.

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<sup>1</sup> See Henning 2014: AN ECOLOGICAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED RENEWABLE ENERGY GENERATION PROJECT ON PORTION 40 OF THE FARM EENDUIN

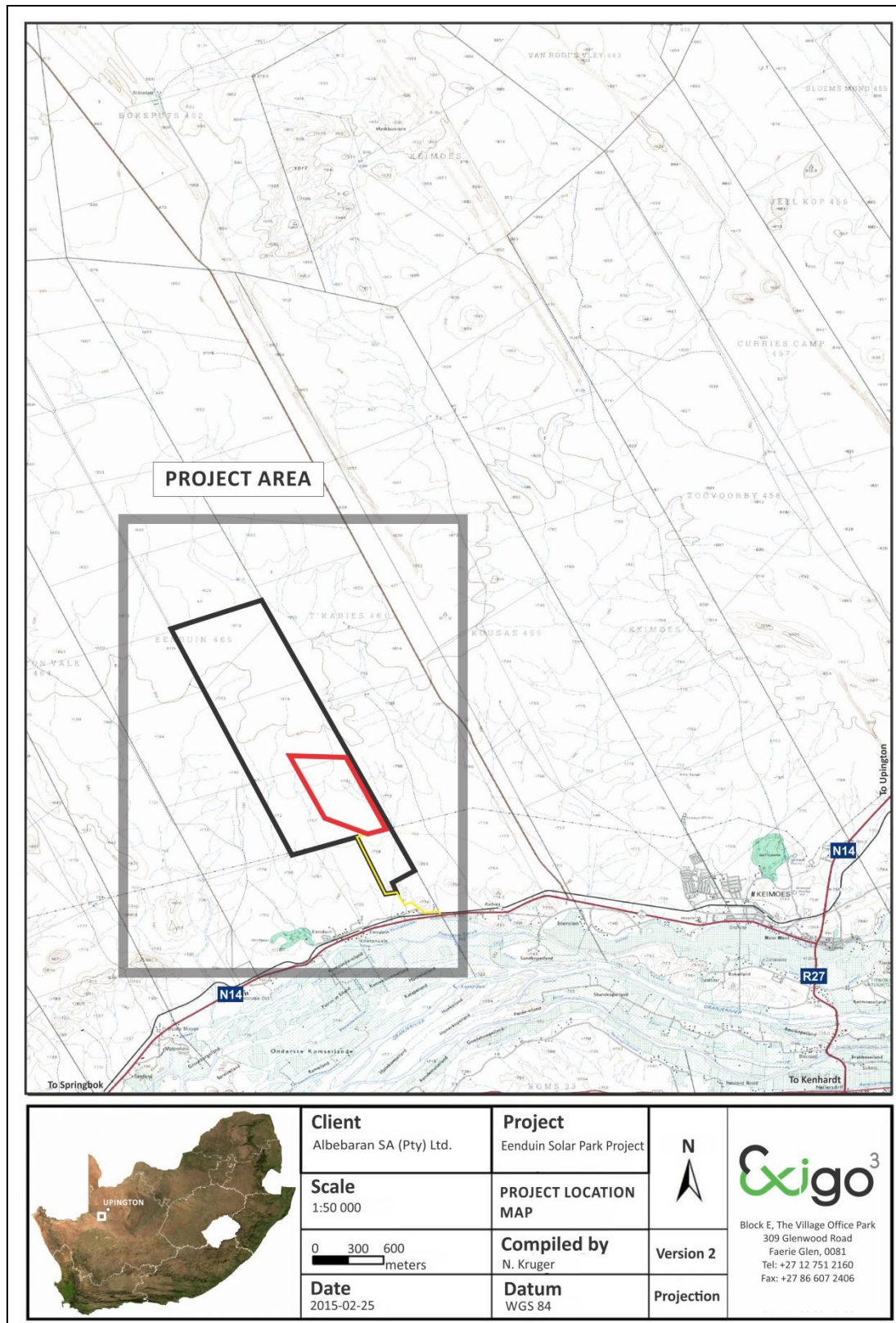


Figure 2-1: 1:50 00 Map representation of the location of the Eenduin Solar Park, access roads and power line Project Area (sheet 2820DB).



Figure 2-2: Panorama view of the Eenduin at the time of the field survey, looking south-east (September 2014).



Figure 2-3: Panorama view of the Eenduin at the time of the field survey, looking east (September 2014).

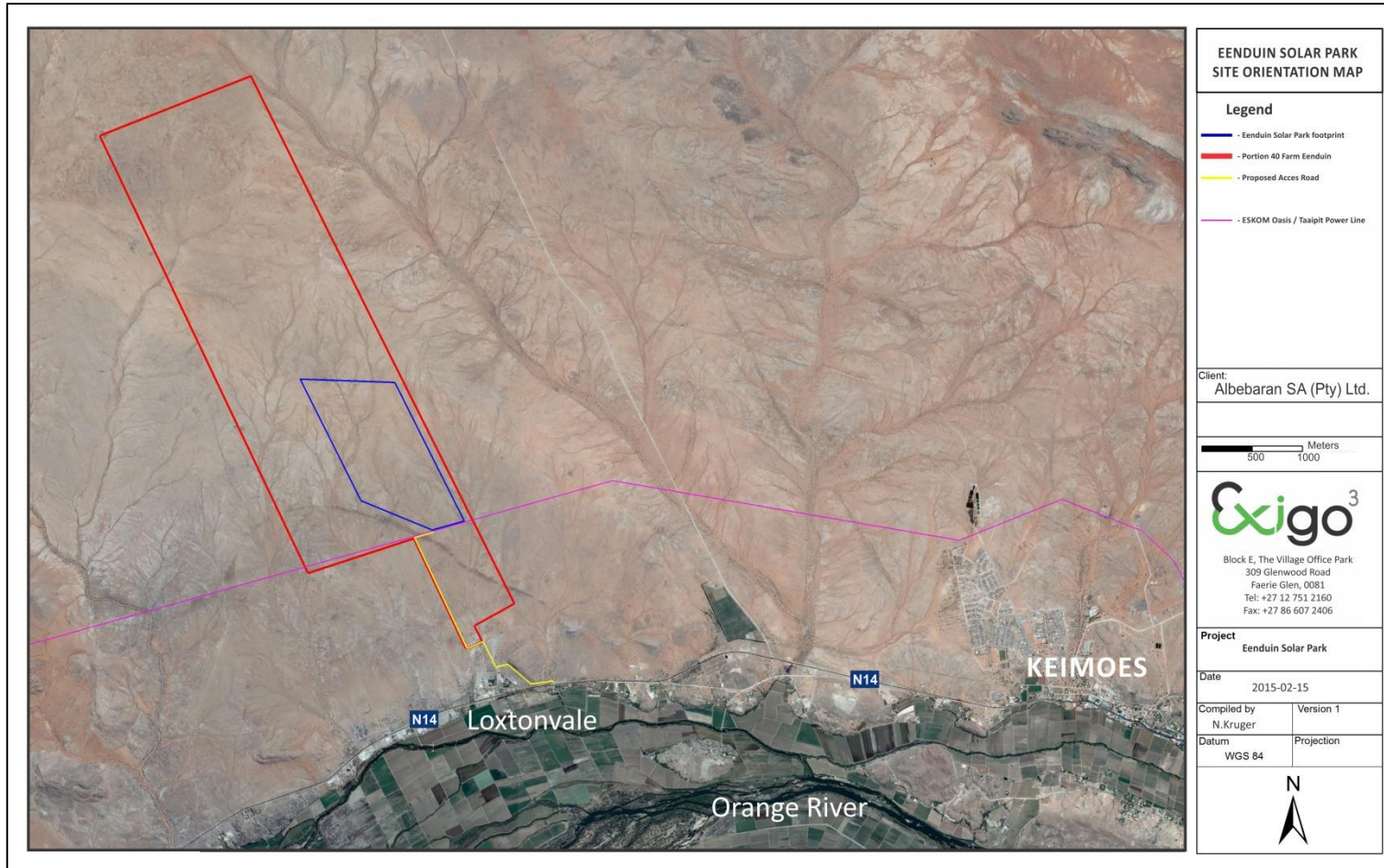


Figure 2-4: Aerial representation of the regional setting for the Eenduin Solar Park, access roads and power line and project components.

### 3 METHOD OF ENQUIRY

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#### 3.1 Sources of Information

Data from detailed desktop, aerial and field studies were employed in order to sample surface areas systematically and to ensure a high probability of heritage site recording.

##### 3.1.1 Desktop Study

A desktop study was prepared in order to contextualize the proposed project within a larger historical milieu. The study focused on relevant previous studies, archaeological and archival sources, aerial photographs, historical maps and local histories, all pertaining to the Keimoes area and the larger landscape of this section of the Northern Cape Province.

A number of heritage studies have been conducted in the larger landscape around Upington. However, the few studies focusing on the Keimoes area have emanated from Impact Assessment measures for EIA purposes commissioned by the private sector. These studies all point to a landscape of limited human ecology, probably the result of scarce water sources and the general absence of hills or outcrops for shelter. Some of the studies include:

Heritage Impact Assessment for the Proposed Establishment of the Ilanga Solar Thermal Power Plant, near Upington, Northern Cape

Heritage Impact Assessment of the proposed Hydropower station on the Orange River at Neus Island on the farm Zwartbooisberg, east of Kakamas, Northern Cape

First Phase Archaeological & Heritage Assessment of the Housing Developments at Melkstroom 563, Upington, Northern Cape

Phase 1 Archaeological Impact Assessment Report on Portions of the Farm Alheit near Kakamas, Siyanda District Municipality, Northern Cape Province.

HIA for the construction of five substations along the Sishen-Saldanha railway line.

Report on a Phase 1 Archaeological Assessment of the site of proposed Borrow Pits for road- building purposes along Road MR 897 in the vicinity of Swartkop, Jooste Island, near Upington, Northern Cape.

Report on a Phase 1 Archaeological Assessment of the site of proposed Borrow Pits for road- building purposes along Road DR 3322 at Karakoel near Upington, Northern Cape.

Heritage Impact Assessment Report for the Proposed Establishment of the African Rainbow Energy, Upington.

Heritage Scoping Assessment for the Proposed Establishment of the Medenergy Upington PV Power Plant.

Archaeological Impact Assessment for the Environmental Impact Management Plan for the Proposed

Upington Solar Thermal Plant, Northern Cape Province.

Heritage Impact Assessment for the Proposed Kangnas Wind and Solar Energy Facilities, Namakwa Magisterial District, Northern Cape

Proposed Kwartelspan PV Power Station I and Associated Infrastructure, Pixley ka Seme District Municipality, Northern Cape Province.

Spatial patterning of the ceramic Later Stone Age in the northern Cape Province, South Africa.

Phase 1 Archaeological Impact Assessment proposed for the proposed Keren Energy Kakamas Solar Plant on Erf 1654, Kakamas.

Phase 1 Archaeological Impact Assessment for the proposed construction of a water treatment plant and supply pipeline from Keimoes to Kenhardt, Western Cape Province.

Heritage Impact Assessment for the proposed Augrabies Solar Energy Facility, Kenhardt Magisterial District, Northern Cape.

### **3.1.2 Aerial Representations and Survey**

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. This method was applied to assist the foot and automotive site surveys where depressions, variation in vegetation, soil marks and landmarks were examined. Specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. By superimposing high frequency aerial photographs with images generated with Google Earth, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as referenced points from where further vehicular and pedestrian surveys were carried out. From the aerial survey it is evident that some surface areas subject to the Eenduin Solar Park, access roads and power line Project have been subjected to historical and more recent disturbances and impacts as a result of natural agents as well as quarrying and infrastructure development (see Figure 3-1).

### **3.1.3 Field Survey**

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the footprint areas proposed for the Eenduin Solar Park as well as the access road and power line routes was conducted in September 2014. The process encompassed a systematic field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. In order to sample surface areas systematically and to ensure a high probability of site recording, the Solar Park footprint including the short corridors demarcated for the high-voltage power lines allowing intervention into the existing Eskom grid, were systematically surveyed on foot by means of a transect survey. The route demarcated for the access road were also investigated by means of a foot survey along these routes (see GPS Track log in Figure 3-1). GPS reference points identified during the aerial survey were also visited and random spot checks were made (see detail in previous section). Using a Garmin E-trex Legend GPS objects and structures of archaeological / heritage value were recorded and

photographed with a Canon 450D Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

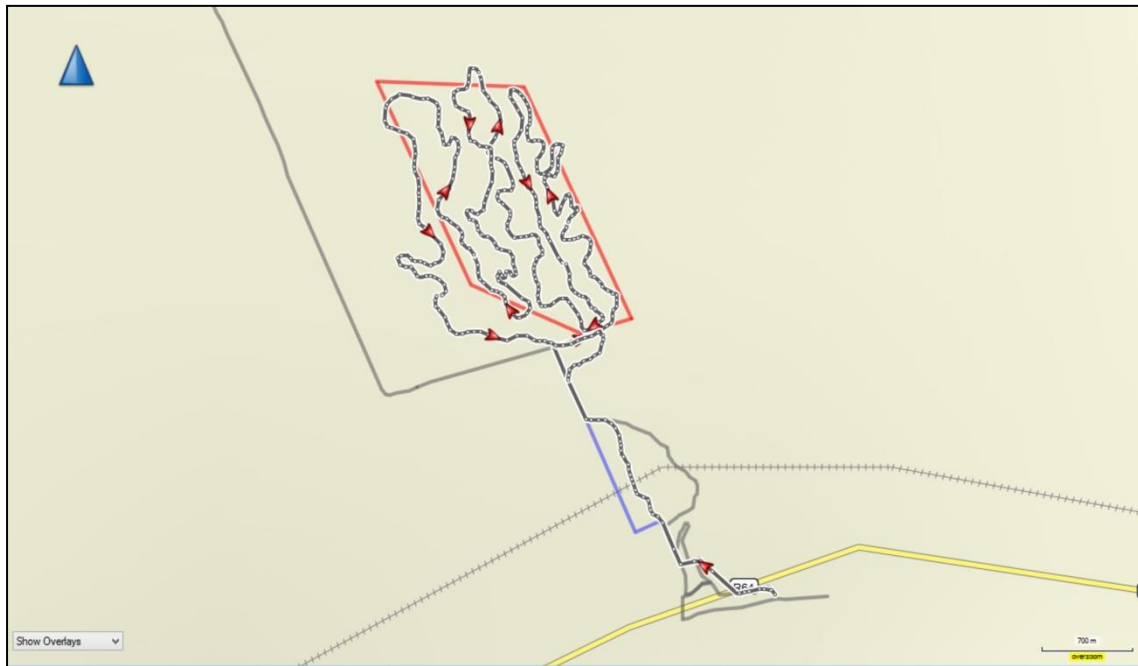


Figure 3-1: Garmin GPS Track log for the site survey of the Eenduin Solar Park, access roads and power line (indicated in grey and dotted grey). The footprint area for the Solar Park is indicated in red and the proposed access road is indicated in blue.

### 3.2 Limitations

#### 3.2.1 Access

Portion 40 of the farm Eenduin is accessed directly via the N14 national route which connects to the towns of Keimoes and Upington. Access control is applied to the farm portions relevant to this assessment but no restrictions were encountered during the site visit as the author of this report was granted access by the owner of the farm. A number of farm service roads provided vehicular access to most areas within the demarcated footprint area.

#### 3.2.2 Visibility

The surrounding vegetation in the study area is mostly comprised out of low scrubs, grasslands and scattered trees with the occurrence of semi-arid succulents in places. Vegetation being sparse, surface archaeological traces were fairly to highly visible, particularly in places where the predominant geological processes of recent times have been erosional rather than depositional. As such, the general visibility at the time of the initial AIA survey (September 2014) ranged between moderate to high visibility in areas to the north, high visibility in the central and southern portions of the study area (see Figures 3-2 to 3-11). In single cases during the survey sub-surface inspection was possible. Where applied, this revealed no archaeological deposits.





Figure 3-2: View of general surroundings on the farm Eenduin along the south-eastern periphery of the study area, looking east.



Figure 3-3: View of general surroundings on the farm Eenduin. Note the occurrence of quartzite extrusions.



Figure 3-4: View of general surroundings on the farm Eenduin along the eastern periphery of the study area, looking west.



Figure 3-5: View of general surroundings on the farm Eenduin along the northern periphery of the study area, looking south.



Figure 3-6: View of general surroundings in the northern section of the study area. Note animal burrowing activity in deep red sands.



Figure 3-7: View of general surroundings on the farm Eenduin in a central portion, looking south.



Figure 3-8: View of rock outcrops along the north-western periphery of the study area.



Figure 3-9: View of general surroundings on the farm Eenduin along the southern periphery of the study area, looking north.



Figure 3-10: View of general surroundings on the farm Eenduin along the proposed access road route.



Figure 3-11: View of general surroundings on the farm Eenduin along the proposed access road route.

### 3.2.3 Limitations and Constraints

The pedestrian site survey for the Eenduin Solar Park, access roads and power line Project AIA primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the aerial survey) as well as areas of high human settlement catchment. The following constraints were encountered:

- **Survey Time and Extent:** Survey time proved to be a constraint due to the relatively large surface extent of the footprint area. Therefore, pedestrian site surveys focused around areas tentatively identified as sensitive (i.e. along drainage lines and those noted during the aerial survey) during aerial surveys.
- **Visibility:** Visibility proved to be a minor constrain in areas with denser surface cover, as well as portions where vegetation is more pristine.

Thus, even though it might be assumed that survey findings are representative of the heritage landscape of the project area for the Eenduin Solar Park, access roads and power line, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

### 3.3 Impact Assessment

For consistency among specialists, impact assessment ratings by AGES Specialist are generally done using the Plomp<sup>2</sup> impact assessment matrix scale supplied by AGES. According to this matrix scale, each heritage

<sup>2</sup> Plomp, H.,2004

receptor in the study area is given an impact assessment. A cumulative assessment for the proposed project is also included.

#### 4 ARCHAEO-HISTORICAL CONTEXT

##### 4.1 The archaeology of Southern Africa

Archaeology in southern Africa is typically divided into two main fields of study, the **Stone Age** and the **Iron Age** or **Farmer Period**. The following table provides a concise outline of the chronological sequence of periods, events, cultural groups and material expressions in Southern African pre-history and history.

**Table 1 Chronological Periods across southern Africa**

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: <i>Australopithecines</i> <i>Homo habilis</i> <i>Homo erectus</i>	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First <i>Homo sapiens</i> species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	<i>Homo sapiens sapiens</i> including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 – 1350 AD	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.
Late Iron Age / Later Farmer Period 1400 AD -1850 AD	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

##### 4.1.1 The Stone Ages

###### - The Earlier Stone Age (ESA)

The Earlier Stone Age from between 1.5 million and 250 000 years ago refers to the earliest that *Homo sapiens sapiens* predecessors began making stone tools. The earliest stone tool industry was referred to as the Olduvai Industry originating from stone artefacts recorded at Olduvai Gorge, Tanzania. The Acheulian Industry, the predominant southern African Early Stone Age Industry, replaced the Olduvai Industry approximately 1.5 million years ago, is attested to in diverse environments and over wide geographical areas. The hallmark of the Acheulian Industry is its large cutting tools (LCTs or bifaces), primarily handaxes and cleavers. Bifaces emerged in East Africa more than 1.5 million years ago but have been reported from a wide range of areas, from South Africa to northern Europe and from India to the Iberian coast. Earlier Stone Age deposits typically occur on the flood-plains of perennial rivers. These ESA open sites sometimes contain stone tool scatters and manufacturing debris ranging from pebble tool choppers to core tools such

as handaxes and cleavers. These groups seldom actively hunted and relied heavily on the opportunistic scavenging of meat from carnivore kill sites. The most well-known Early Stone Age site in southern Africa is Amanzi Springs, situated about 10km north-east of Uitenhage, near Port Elizabeth (Deacon 1970). In a series of spring deposits a large number of stone tools were found in situ to a depth of 3-4m. Wood and seed material preserved remarkably very well within the spring deposits, and possibly date to between 800 000 to 250 000 years old.

#### - **The Middle Stone Age (MSA)**

The Middle Stone Age (MSA) spans a period from 250 000-30 000 years ago and focuses on the emergence of modern humans through the change in technology, behaviour, physical appearance, art and symbolism. Various stone artefact industries occur during this time period, although less is known about the time prior to 120 000 years ago, extensive systemic archaeological research is being conducted on sites across southern Africa dating within the last 120 000 years (Thompson & Marean 2008). The large handaxes and cleavers were replaced by smaller stone artefacts called the MSA flake and blade industries. Surface scatters of these flake and blade industries occur widespread across southern Africa although rarely with any associated botanical and faunal remains. It is also common for these stone artefacts to be found between the surface and approximately 50-80cm below ground. Fossil bone may in rare cases be associated with MSA occurrences (Gess 1969). These stone artefacts, like the Earlier Stone Age handaxes are usually observed in secondary context with no other associated archaeological material. The MSA is distinguished from the ESA by the smaller-sized and distinctly different stone artefacts and chaîne opératoire (method) used in manufacture, the introduction of other types of artefacts and evidence of symbolic behaviour. The prepared core technique was used for the manufacture of the stone artefacts which display a characteristic faceted striking platform and includes mainly unifacial and bifacial flake blades and points. The Howiesons Poort Industry (80 000-55 000 years ago) is distinguished from the other MSA stone artefacts: the size of tools are generally smaller, the range of raw materials include finer-grained rocks such as silcrete, chalcedony, chert and hornfels, and include segments, backed blades and trapezoids in the stone toolkit which were sometimes hafted (set or glued) onto handles. In addition to stone artefacts, bone was worked into points, possibly hafted, and used as tools for hunting (Deacon & Deacon 1999). Other types of artefacts that have been encountered in archaeological excavations include tick shell beads, the rim pieces of ostrich eggshell (OES) water flasks, ochre-stained pieces of ostrich eggshell and engraved and scratched ochre pieces, as well as the collection of materials for purely aesthetic reasons. The majority of MSA sites occur on flood plains and sometimes in caves and rock shelters. Sites usually consist of large concentrations of knapped stone flakes such as scrapers, points and blades and associated manufacturing debris. Tools may have been hafted but organic materials, such as those used in hafting, seldom remain preserved in the archaeological record. Limited drive-hunting activities are associated with the MSA.

#### - **The Later Stone Age (LSA)**

The Later Stone Age (LSA) spans the period from about 20 000 years ago until the colonial era, although some communities continue making stone tools today. The period between 30 000 and 20 000 years ago is referred to as the transition from the MSA to LSA; although there is a lack of crucial sites and evidence that represent this change. By the time of the Later Stone Age the genus *Homo*, in southern Africa, had developed into *Homo sapiens sapiens*, and in Europe, had already replaced *Homo neanderthalensis*. The LSA is marked by a series of technological innovations, new tools and artefacts, the development of economic, political and social systems, and core symbolic beliefs and rituals. The stone toolkits changed over time according to time-specific needs and raw material availability, from smaller microlithic Robberg, Wilton Industries and in between, the larger Albany/Oakhurst and the Kalkbuis Industries. Bored stones used as part of digging sticks, grooved stones for sharpening and grinding and stone tools fixed to handles with mastic also become more common. Fishing equipment such as hooks, gorges and sinkers also appear within archaeological excavations. Polished

bone tools such as eyed needles, awls, linkshafts and arrowheads also become a more common occurrence. Most importantly bows and arrows revolutionized the hunting economy. It was only within the last 2000 years that earthenware pottery was introduced, before then tortoiseshell bowls were used for cooking and ostrich eggshell (OES) flasks were used for storing water. Decorative items like ostrich eggshell and marine/fresh water shell beads and pendants were made. Hunting and gathering made up the economic way of life of these communities; therefore, they are normally referred to as hunter-gatherers. Hunter-gatherers hunted both small and large game and gathered edible plant foods from the veld. For those that lived at or close the coast, marine shellfish and seals and other edible marine resources were available for the gathering. The political system was mainly egalitarian, and socially, hunter-gatherers lived in bands of up to twenty people during the scarce resource availability dispersal seasons and aggregated according to kinship relations during the abundant resource availability seasons. Symbolic beliefs and rituals are evidenced by the deliberate burial of the dead and in the rock art paintings and engravings scattered across the southern African landscape. Sites dating to the LSA are better preserved in rock shelters, although open sites with scatters of mainly stone tools can occur. Well-protected deposits in shelters allow for stable conditions that result in the preservation of organic materials such as wood, bone, hearths, ostrich eggshell beads and even bedding material. By using San (Bushman) ethnographic data a better understanding of this period is possible. South African rock art is also associated with the LSA.

#### 4.1.2 The Iron Age Farmer Period

##### - Early Iron Age (Early Farming Communities)

The Early Iron Age (also Early Farmer Period) marks the movement of Bantu speaking farming communities into South Africa at around 200 A.D. These groups were agro-pastoralists that settled in the vicinity of water in order to provide subsistence for their cattle and crops. Artefact evidence from Early Farmer Period sites is mostly found in the form of ceramic assemblages and the origins and archaeological identities of this period are largely based upon ceramic typologies and sequences, where diagnostic pottery assemblages can be used to infer group identities and to trace movements across the landscape. Early Farmer Period ceramic traditions are classified by some scholars into different “streams” or trends in pot types and decoration that, over time emerged in southern Africa. These “streams” are identified as the Kwale Branch (east), the Nkope Branch (central) and the Kalundu Branch (west). More specifically, in the northern regions of South Africa at least three settlement phases have been distinguished for prehistoric Bantu-speaking agropastoralists. The first phase of the Early Iron Age, known as Happy Rest (named after the site where the ceramics were first identified), is representative of the Western Stream of migrations, and dates to AD 400 - AD 600. The second phase of Diamant is dated to AD 600 - AD 900 and was first recognized at the eponymous site of Diamant in the western Waterberg. The third phase, characterised by herringbone-decorated pottery of the Eiland tradition, is regarded as the final expression of the Early Iron Age (EIA) and occurs over large parts of the North West Province, Northern Province, Gauteng and Mpumalanga. This phase has been dated to about AD 900 - AD 1200. Early Farmer Period ceramics typically display features such as large and prominent inverted rims, large neck areas and fine elaborate decorations. The Early Iron Age continued up to the end of the first millennium AD.

##### - Middle Iron Age / K2 Mapungubwe Period (early Later Farming Communities)

The onset of the middle Iron Age dates back to ±900 AD, a period more commonly known as the Mapungubwe / K2 phase. These names refer to the well known archaeological sites that are today the pinnacle of South Africa’s Iron Age heritage. The inhabitants of K2 and Mapungubwe, situated on the banks of the Limpopo, were agriculturalists and pastoralists and were engaged in extensive trade activities with local and foreign traders. Although the identity of this Bantu-speaking group remains a point of contestation, the Mapungubwe people were the first state-organized society southern Africa has known. A considerable amount of golden objects, ivory, beads (glass and gold), trade goods and clay figurines as well as large amounts of potsherds were found at these sites and also appear in sites dating back to this phase

of the Iron Age. Ceramics of this tradition take the form of beakers with upright sides and decorations around the base (K2) and shallow-shouldered bowls with decorations as well as globular pots with long necks. (Mapungubwe). The site of Mapungubwe was deserted at around 1250 AD and this also marks the relative conclusion of this phase of the Iron Age.

- **Later Iron Age (Later Farming Communities)**

The late Iron Age of southern Africa marks the grouping of Bantu speaking groups into different cultural units. It also signals one of the most influential events of the second millennium AD in southern Africa, the difaqane. The difaqane (also known as “the scattering”) brought about a dramatic and sudden ending to centuries of stable society in southern Africa. Reasons for this change was essentially the first penetration of the southern African interior by Portuguese traders, military conquests by various Bantu speaking groups primarily the ambitious Zulu King Shaka and the beginning of industrial developments in South Africa. Different cultural groups were scattered over large areas of the interior. These groups conveyed with them their customs that in the archaeological record manifest in ceramics, beads and other artefacts. This means that distinct pottery typologies can be found in the different late Iron Age groups of South Africa.

- **Bantu Speaking Groups in the South African interior**

*It should be noted that terms such as “Nguni”, “Sotho”, “Venda” and others refer to broad and comprehensive language groups that demonstrated similarities in their origins and language. It does not imply that these Nguni / Sotho groups were homogeneous and static; they rather moved through the landscape and influenced each other in continuous processes marked by cultural fluidity.*

Ethnographers generally divide major Bantu-speaking groups of southern Africa into two broad linguistic groups, the Nguni and the Sotho with smaller subdivisions under these two main groups. Nguni groups were found in the eastern parts of the interior of South Africa and can be divided into the northern Nguni and the southern Nguni. The various Zulu and Swazi groups were generally associated with the northern Nguni whereas the southern Nguni comprised the Xhosa, Mpondo, Thembu and Mpondomise groups. The same geographically based divisions exist among Sotho groups where, under the western Sotho (or Tswana), groups such as the Rolong, Hurutshe, Kwena, Fokeng and Kgatla are found. The northern Sotho included the Pedi and amalgamation of smaller groups united to become the southern Sotho group or the Basutho. Other smaller language groups such as the Venda, Lemba and Tshonga Shangana transpired outside these major entities but as time progressed they were, however to lesser or greater extent influenced and absorbed by neighbouring groups.

#### **4.1.3 Pastoralism and the last 2000 years**

Until 2000 years ago, hunter-gatherer communities traded, exchanged goods, encountered and interacted with other hunter-gatherer communities. From about 2000 years ago the social dynamics of the southern African landscape started changing with the immigration of two 'other' groups of people, different in physique, political, economic and social systems, beliefs and rituals. One of these groups, the Khoekhoe pastoralists or herders entered southern Africa with domestic animals, namely fat-tailed sheep and goats, travelling through the south towards the coast. They also introduced thin-walled pottery common in the interior and along the coastal regions of southern Africa. Their economic systems were directed by the accumulation of wealth in domestic stock numbers and their political make-up was more hierarchical than that of the hunter-gatherers.

#### **4.1.4 Historical and Colonial Times and Recent History**

The Historical period in southern Africa encompass the course of Europe's discovery of South Africa and the spreading of European settlements along the East Coast and subsequently into the interior. In addition, the formation stages of this period are marked by the large scale movements of various Bantu-speaking



groups in the interior of South Africa, which profoundly influenced the course of European settlement. Finally, the final retreat of the San and Khoekhoen groups into their present-day living areas also occurred in the Historical period in southern Africa.

#### **4.2 The Keimoes Area: Specific Themes.**

The history of the Northern Cape Province is reflected in a rich archaeological landscape, mostly dominated by Stone Age occurrences. Generally, numerous sites documenting Earlier, Middle and Later Stone Age habitation occur across the province, mostly in open air locales or in sediments alongside rivers or pans. In addition, a wealth of Later Stone Age rock art sites, most of which are in the form of rock engravings are to be found in the larger landscape. These sites occur on hilltops, slopes, rock outcrops and occasionally in river beds. Sites dating to the Iron Age occur in the north eastern part of the Province and environmental factors delegated that the spread of Iron Age farming westwards from the 17th century was constrained mainly to these areas. However, evidence of an Iron Age presence as far as the Upington area in the eighteenth century occurs in this area. Moving into recent times, the archaeological record reflects the development of a rich colonial frontier, characterised by, amongst others, a complex industrial archaeological landscape such as mining developments at Kimberley, which herald the modern era in South African history. Except for a few AIA Studies, no previous archaeological work has been done in Keimoes. One of these AIA's for a proposed solar farm in Kakamas, about 40 kms west of Keimoes documented relatively small numbers of LSA lithics in banded ironstone (Kaplan 2012). Such implements were also found during a survey for a water pipeline between Kakamas and Kenhardt (Kaplan 2008), while Orton (2012) recently recorded very low density scatters of LSA and MSA tools in quartz, indurated shale and banded ironstone for a proposed solar farm near the Augrabies Falls National Park.

##### **4.2.1 The Earlier, Middle and Later Stone Ages**

The archaeological record of this region involves the timespan from the Earlier Stone Age (1 500 000 to about 270 000 years ago), through the Middle Stone Age (about 270 000 - 40 000 years ago), to the Later Stone Age. Towards the east the last 2000 years showed an increase in ceramic sites as well as Iron Age expansions sometimes in conjunction with Stone Age communities (Morris & Beaumont 2004). In contrast with this the areas towards the west could possibly sustain specialized foraging for much longer. In the absence of rock outcrops, no rock art sites are known. Earlier Stone Age sites in the larger Orange River basin have been documented to the south of Eenzaamheid Pan in areas strewn with Dwyka tillite, which provided ample raw material. John Masson (2006) has reported such material at Eenzaamheid Pan. Other known sites in the region are Biesje Poort 2, about 10 km to the west, where an extensive Doornfontein site was dated to 1400 BP (Beaumont et al. 1995), and Renosterkop, 10km to the south west, where two Ceramic LSA sites were found, the one, in a small shelter (Morris & Beaumont 1991). This site and another cave site closer to Keimoes (Smith 1995), are the only regional sites to have yielded stratified successions, with both indicating a MSA presence of likely early MIS 5 age and then LSA occupations of the Holocene. Some Acheulean sites are found on the farms Droëhout and Ratel Draai, however these are not stratified (Beaumont *et al.* 1995).

Late Holocene Later Stone Age (LSA) sites are often mentioned in surveys in the wider region and along the Orange River (e.g. Morris & Beaumont 1991; Beaumont et al. 1995). These are most probably short-duration occupations by groups of hunter-gatherers. In contrast, there are substantial herder encampments along the Orange River floodplain itself (Morris & Beaumont 1991) and in the hills north of Kakamas (Parsons 2003). Beaumont et al. (1995:240-1) notes a widespread low-density stone artefact scatter of Pleistocene age across much of Bushmanland to the south where raw materials from Dwyka glacial till produced mainly quartzite cobble. Similar occurrences have been noted north of Upington

closer to the study area, in situations where raw materials are abundant. Systematic collections of this material at Olyvenkolk south west of Kenhardt and Maans Pannen east of Gamoep could be separated out by abrasion state into a fresh component of Middle Stone Age (MSA) with prepared cores, blades and points, and a large aggregate of moderately to heavily weathered Earlier Stone Age (ESA) (Beaumont et al. 1995).

Very low density "off-site" scatters of ESA and MSA material has been noted over large areas on plains both north and south of the Orange River where raw materials are less readily to hand. These most likely reflect opportunistic knapping of nodules of raw material. These once again could also be anticipated on site (Parsons 2003). Webley (2009) mentions the possibility of discovering Middle Stone Age artifacts on the dune plains. Such artifacts have been reported by Morris (2007a) from the Groblershoop area, while Webley, Lanham & Miller (2010) have recovered similar scatters to the east of the Langeberg. These have been found on the edge of calcrete-lined pans and in road cuttings (Webley & Halkett, 2010). Both Middle and Later Stone Age sites have been reported from amongst the dunes to the south of the Langeberg, at Witsand (Morris 1990). The LSA here is classified as Wilton and includes scrapers and backed pieces. Some sites also contain pottery and are termed Ceramic LSA assemblages. Webley, Lanham & Miller (2010) have found a ceramic LSA site on the farm Gaston some 20km northeast in the foothills of the Langeberg Mountains (Webley & Halkett, 2010).

#### **4.2.2 Rock Markings**

Rock engravings are mostly situated in the semi-arid plateau with most of these engravings situated at the Orange – Vaal basin, Karoo and Namibia. The upper Vaal, Limpopo basin and eastern Free State regions have a small quantity of rock engravings as well. Generally, rock paintings exist at cave areas and rock engravings at open surface areas. The Cape interior consists of a technical, formal and thematic variation between and within sites (Morris 1988). Two major techniques existed namely the incised and pecked engravings. Morris (1988) indicated technical and formal characteristics through space and a sharp contrast exists between engravings positioned north of the Orange River that are mostly pecked and those in the Karoo where scraping was mostly used. According to Morris (1988) hairline engravings occur at the North and the South, but they are rare at the Vryburg region. Finger painting techniques mostly occur at the Kuruman Hills, Asbestos Mountains, Ghaap Escarpment, Langeberg, Koranaberg ranges, scattered sites at the Karoo and the Kareeberge (Morris 1988). The development petroglyphs (i.e. carving or line drawing on rock) were associated with three different types of techniques, namely incised fine lines, pecked engravings and scraped engravings. According to Peter Beaumont the pecked and scraped engravings at the Upper Karoo are coeval (i.e. having the same age or date of origin) (Beaumont P B et al. 1989). Dating of rock art includes the use of carbonate fraction dating of ostrich eggshell pieces, dating of charcoal and ostrich eggshell at various rock art shelters. Unifacial points, double segments and thin – walled sherds may indicate the presence of the Khoikhoi at the Northern Cape during 2500 BP (years Before the Present) (Beaumont 1989).

#### **4.2.3 The Iron Age / Farmer Period**

The beginnings of the Iron Age (Farmer Period) in southern Africa are associated with the arrival of a new Bantu speaking population group at around the third century AD. These newcomers introduced a new way of life into areas that were occupied by Later Stone Age hunter-gatherers and Khoekhoe herders. Distinctive features of the Iron Age are a settled village life, food production (agriculture and animal husbandry), metallurgy (the mining, smelting and working of iron, copper and gold) and the manufacture of pottery. Stone ruins indicate the occurrence of Iron Age settlements in the Northern Cape specifically at sites such as Dithakong where evidence exists that the Thlaping used to be settled in the Kuruman –

Dithakong areas prior to 1800 (Humphreys 1976). Here, the assessment of the contact between the Stone Age, Iron Age and Colonial societies are significant in order to understand situations of contact and assimilation between societies. As an example, Trade occurred between local Tlhaping Tswana people and the Khoikhoi communities. It means that the Tswana traded as far south as the Orange River at least the same time as the Europeans at the Cape (Humphreys 1976).

Morris (1990) reports that the area to the west of the Langeberg was once settled by the BaTlhaping. He notes that 35 km due north of Witsand lies the modern farm of Nokanna, which he says equates with the former BaTlhaping capital of Nokana or Nokaneng. Historically, the Trekboers traversed this area during the late 19<sup>th</sup> century. More recent research by Jacobs shows occupational Tswana site to occur during the later "Bantu Expansion" and "Proto-Difiqane between c1750 and 1830 in the study area. Specifically the Tlhaping and Tlharo chiefdoms are referred to here (N. J. Jacobs, 1999). It is even suggested that some Sotho-Tswana people might have preceded the Tlhaping and Tlharo in this region. This is however not a recent postulations since Ellenberger and MacGregor already proposed earlier Iron Age communities in these areas as early as 1912 (Ellenberger & MacGregor, 1912).

#### 4.2.4 Later History: Colonial Period

The town of Upington, approximately 40km east of Keimoes was a major regional agricultural and economic centre in the 19<sup>th</sup> century. The German missionary Rev Schröder founded the town of Upington, originally known as Olijvenhoutsdrift, in 1871 as part of a mission station. The town was renamed in 1884 after Sir Thomas Upington, who was the Prime Minister of the Cape Colony and who visited the town in 1884. In 1895 British Bechuanaland became part of the Cape Colony, which meant that the Lower Orange River regions, Gordonia, Namaqualand and Bushman land, now fell under the Cape Colonial Government. The town of Keimoes, which was originally a mission station, was founded in 1899 and it attained municipal status in 1949. The name is of Khoekhoen origin and means "large eye", i.e. spring or fountain. The farm Eenduin was established in the late 1800's.

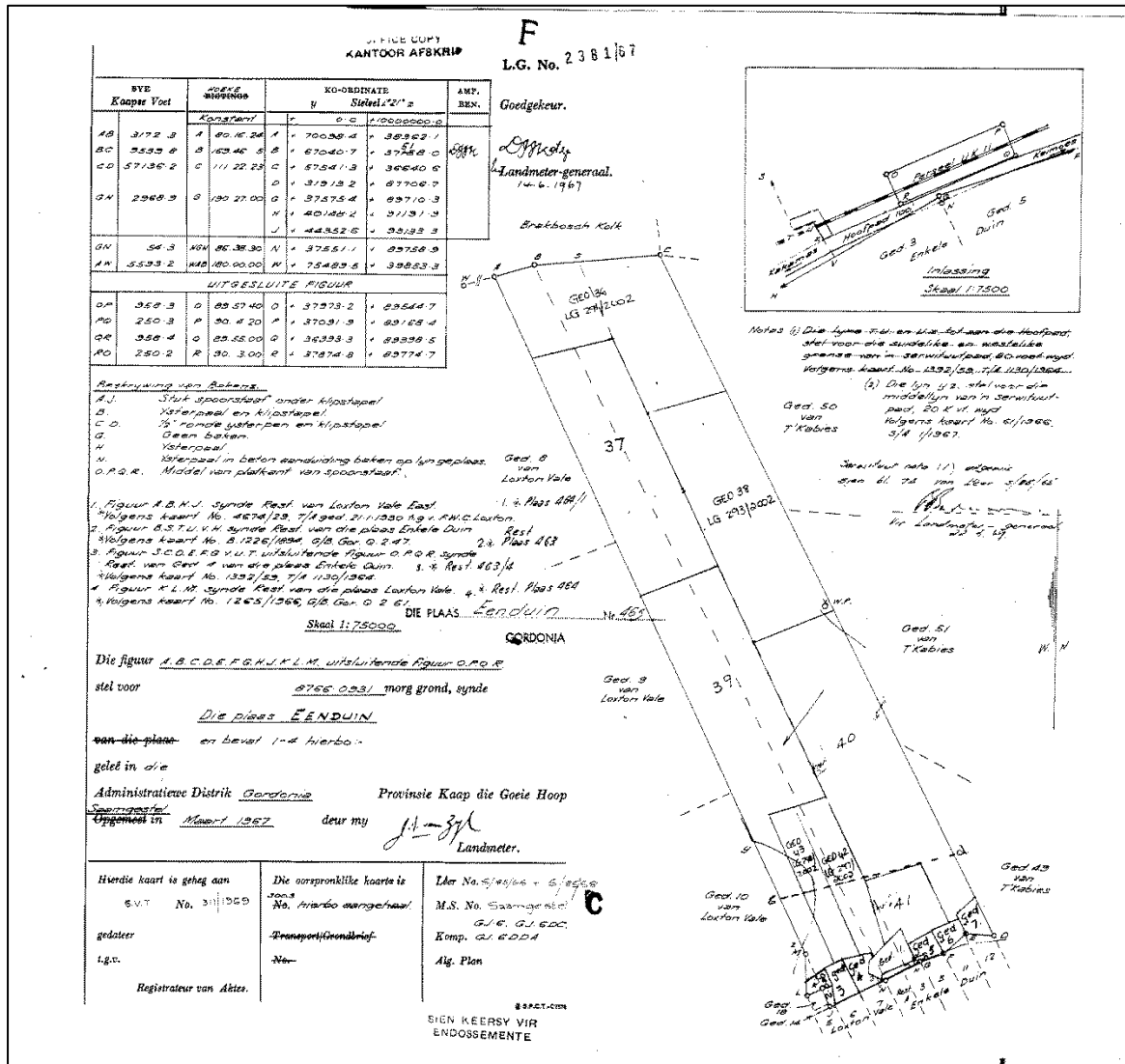


Figure 4-1: Title deed and amendments for the farm Eenduin.

4.2.5 Burial Sites / Human Remains

Human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface. Human remains are usually observed when they are exposed through erosion. In some instances packed stones or rocks may indicate the presence of informal pre-colonial burials. If any human bones are found during the course of construction work then they should be reported to an archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. Where human remains are part of a burial they would need to be exhumed under a permit from either SAHRA (for pre-colonial burials as well as burials later than about AD 1500).

## 5 RESULTS: ARCHAEOLOGICAL SURVEY

In terms of heritage resources, the landscape around the Eenduin Solar Park, access roads and power line project area is primarily well known for the occurrence of Stone Age and Colonial Period heritage remains. Similarly, a number of Stone Age occurrences were noted in the project infrastructure footprint areas. These occurrences were uniquely coded **EXIGO-EDP40-SAxx** (Exigo Eenduin Portion 40 Stone Age XX).

### 5.1 The Stone Age

Middle Stone Age (MSA) and Later Stone Age (LSA) scatters and quarries occur frequently in low lying areas on plains between dune straights and outcrops along the Orange River in the Northern Cape. This presence of Stone Age people in the landscape can probably be attributed to the abundance of locally available raw material for the manufacture of stone tools. During the site survey, MSA material was documented at a number of localities the survey area, some of which near drainage channels and in association with exposed decomposing calcrete deposits. The density of the scatters were arbitrarily estimated by placing a one-meter drawing frame, sub-divided into quadrants, on a randomly-selected area displaying higher amounts of surface lithics. By plotting the counts of all lithic elements present in the 1x1 metre square relative density per m<sup>2</sup> was established and rated on a scale of low (<10), medium (10-20) and high (>20). This method has been adapted as expedient and non-invasive sampling technique that is particularly useful in value assessment of lithic occurrences during Phase 1 AIA's (see Van Der Ryst 2012).

- **EXIGO-EDP40-SA01: Low Density MSA Occurrence (S28.70490° E20.89387°)**

Single MSA lithics were noted along the southern portion of the proposed access road route to the N14. The lithic remains; specifically a broken point, a retouched side scraper and a flake tool were produced from hornfels and banded iron stone. Since the access road alignment follows an existing gravel road for the largest part, this area has also been adversely altered and disturbed and the occurrence is of low heritage value due to the loss of artefact context and the low density of the lithic occurrence.



Figure 5-1: A broken MSA point (left), a broken blade (centre) and retouched side scraper (right) from EXIGO-EDP40-SA01.

- EXIGO-EDP40-SA02: Low Density MSA Occurrence (S28.68494° E20.87456°)
- EXIGO-EDP40-SA03: Low Density MSA Occurrence (S28.68530° E20.87766°)
- EXIGO-EDP40-SA04: Low Density MSA Occurrence (S28.68632° E20.88338°)
- EXIGO-EDP40-SA05: Low Density MSA Occurrence (S28.68240° E20.88117°)
- EXIGO-EDP40-SA06: Low Density MSA Occurrence (S28.68319° E20.87523°)
- EXIGO-EDP40-SA07: Low Density MSA Occurrence (S28.68072° E20.87942°)
- EXIGO-EDP40-SA08: Low Density MSA Occurrence (S28.67710° E20.87638°)
- EXIGO-EDP40-SA09: Low Density MSA Occurrence (S28.67881° E20.87130°)
- EXIGO-EDP40-SA10: Low Density MSA Occurrence (S28.67799° E20.87396°)
- EXIGO-EDP40-SA11: Low Density MSA Occurrence (S28.67428° E20.87325°)
- EXIGO-EDP40-SA12: Low Density MSA Occurrence (S28.67058° E20.87276°)

A number of low density MSA lithic occurrences were identified scattered across the proposed Solar Park footprint area. These occurrences were documented and their locations plotted with a hand held GPS unit. Most of the occurrences occur randomly across the area where precipitation and groundwater have exposed the stone tools but in some instances lithics appear within a decomposed calcrete rock layer in association with quartzite deposits. Although there may be some mixing of an earlier MSA assemblage with a few lithics from the more recent LSA utilization, the surface collection shows a predominant MSA signature. Preliminary examinations of some of the lithics, which includes chunks and utilised flake, and formal tools such as scrapers, blades and points as well as adzes, indicate that a number of flakes display faceted platforms, characteristic of the MSA. Here, prepared cores show evidence of the use of the Levallois technique, where surfaces on the core are shaped in order to generate a specific formal tool when flaked from the core. Use wear and marks are clearly visible on formal tools. The raw material used in the production of the lithics is mostly hornfels, shale and banded ironstone. Banded ironstone is known to have been a favoured raw material for making stone artefacts and occurs on a number of sites that have been documented by the archaeologist and others throughout the Northern Cape. It occurs fairly widely over the site and was clearly a desirable raw material which was targeted by LSA people for its superior flaking qualities.

It is not possible to assign an age estimate without an in-depth analysis of a more representative sample. At this stage it would be prudent to say that these open-air collections probably represent a palimpsest of visits by prehistoric groups up to the MSA. No evidence of any factory or workshop site, or the result of any human settlement was identified. A number of the tools are also abraded or weathered suggesting that they have lain on the surface for many years. Most of the stone implements documented during the study comprise isolated occurrences that are spread thinly and unevenly over the surrounding landscape. Generally, the occurrences are lacking in context as no organic remains such as bone, pottery or ostrich eggshell was found. The fairly small numbers and isolated context in which they were found means that the archaeological remains in the Study Area have been rated as having low archaeological significance.



Figure 5-2: An adze from EXIGO-EDP40-SA02.



Figure 5-3: A weather broken adze on banded ironstone from EXIGO-EDP40-SA03.



Figure 5-4: Secondary retouch visible on an MSA point from EXIGO-EDP40-SA05.

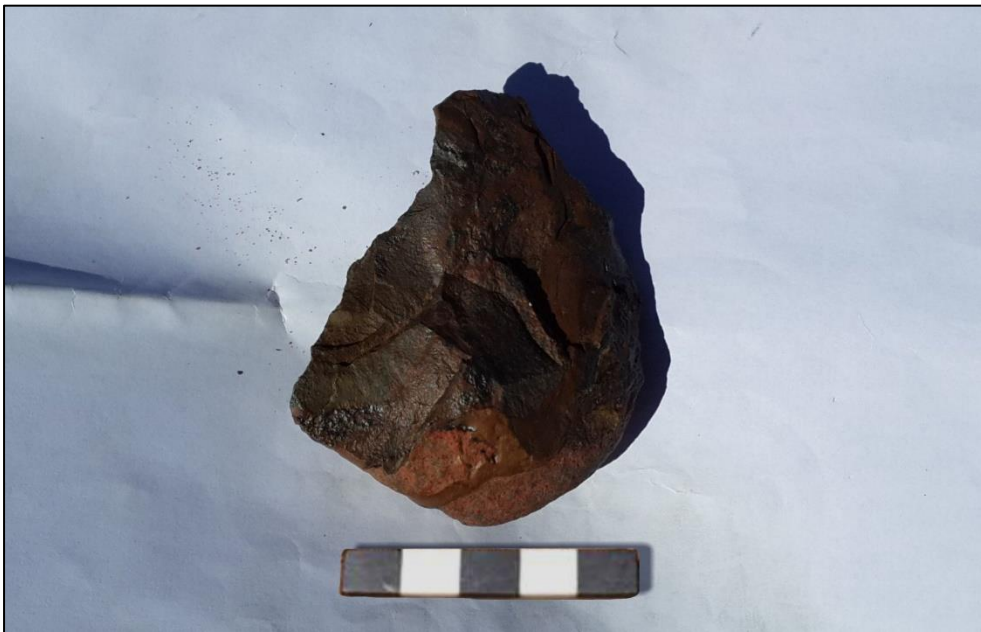


Figure 5-5: A crude point showing utilisation from EXIGO-EDP40-SA06.



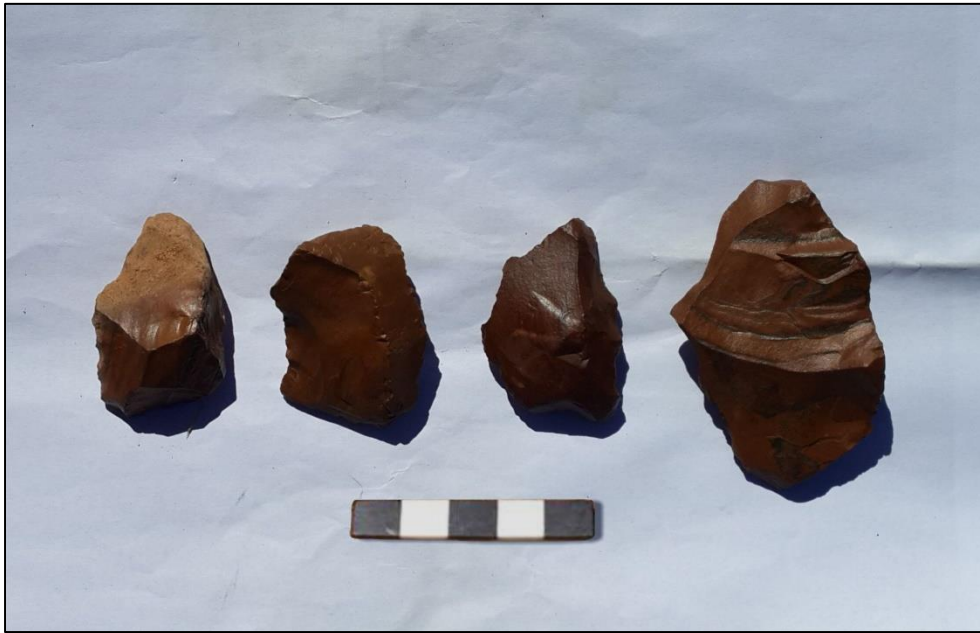


Figure 5-6: Secondary retouch visible on a number of side and end scrapers from EXIGO-EDP40-SA07.



Figure 5-7: Detail of secondary retouch and utilisation on various side scrapers from EXIGO-EDP40-SA08.

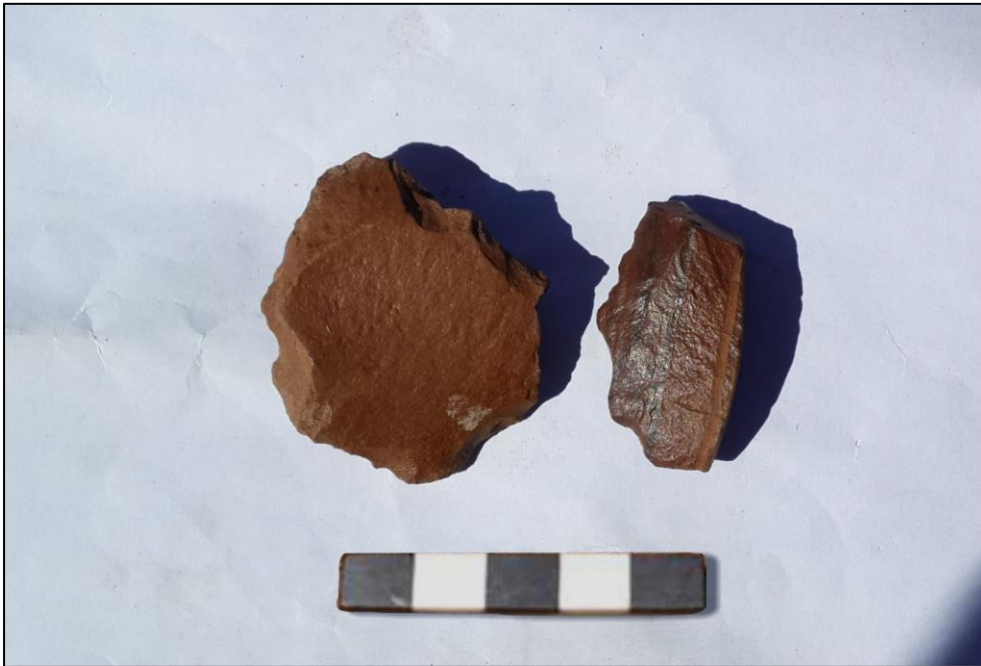


Figure 5-8: A round scraper (left) and side scraper (right) from EXIGO-EDP40-SA09.

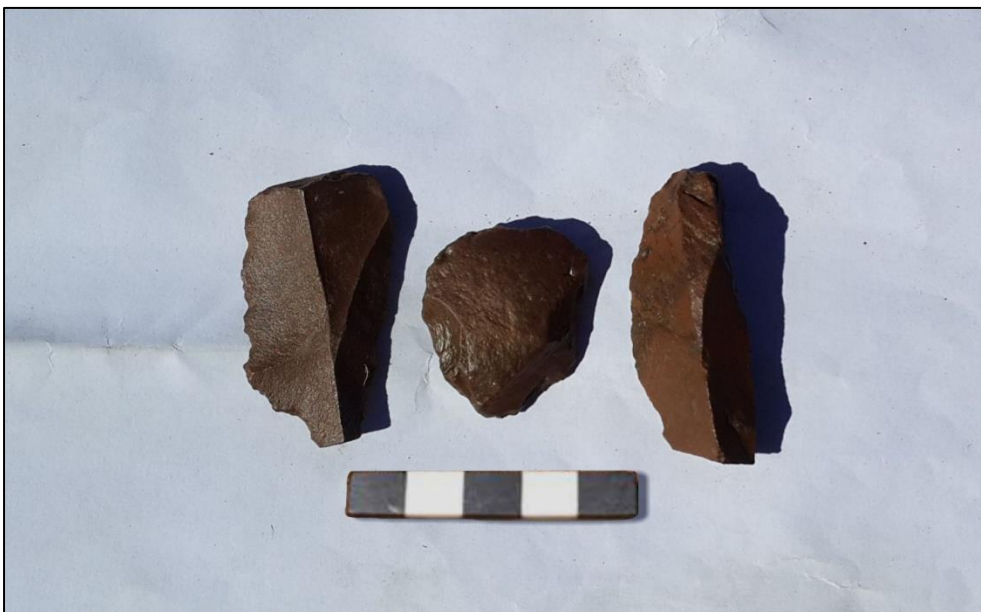


Figure 5-9: A broken point (left), scraper (centre) and broken blade (right) from EXIGO-EDP40-SA12.

## **5.2 The Iron Age Farmer Period**

No Iron Age (Farmer Period) occurrences were observed in any of the survey areas.

## **5.3 Historical / Colonial Period**

No Historical / Colonial Period occurrences were observed in any of the survey areas. In terms of the built environment, the area has no significance, as there are no old buildings, structures, or features, old equipment, public memorial or monuments in the footprint area.

## **5.4 Graves / Human Burials**

No human burials were observed in any of the survey areas. Should any unmarked human burials/remains or ostrich eggshell water flask caches be uncovered, or exposed during construction activities, these must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA). Burials must not be removed or disturbed until inspected by the archaeologist

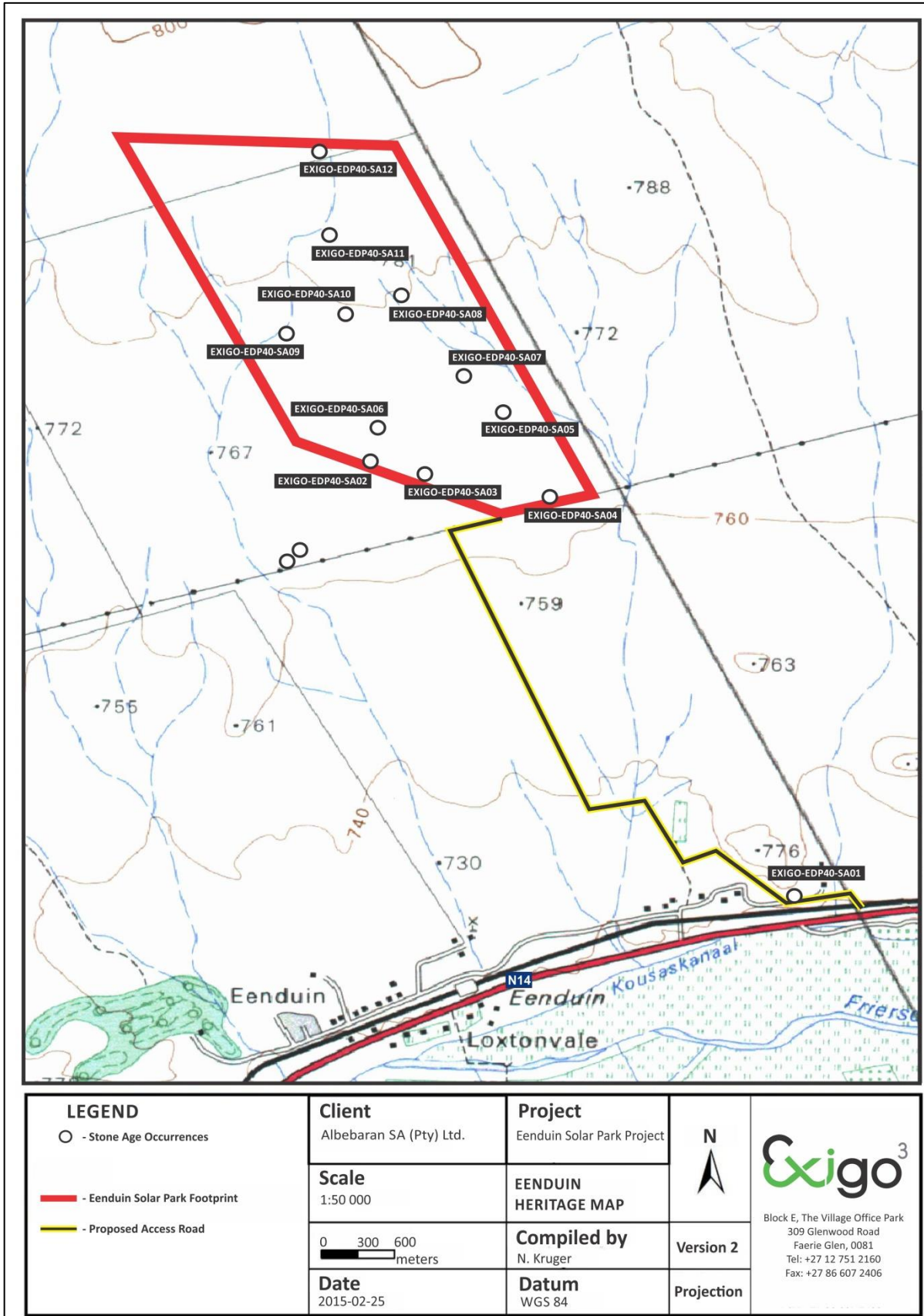


Figure 5-10: Topographic map indicating the locations of all heritage occurrences discussed in the text.

**6 RESULTS: STATEMENT OF SIGNIFICANCE AND IMPACT RATING**

**6.1 Potential Impacts and Significance Ratings<sup>3</sup>**

The following section provides a background to the identification and assessment of possible impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Section 10.2 of the Addendum.

**6.1.1 General assessment of impacts on resources**

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts.

**6.1.2 Direct impact rating**

**Direct or primary effects** on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. **Indirect effects or secondary effects** on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access (refer to Section 10.3 in the Addendum for an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected). Significant heritage receptors were found in the project zones and potential impacts to heritage resources is foreseen. The following table summarizes impacts to archaeological material anticipated for the Eenduin Solar Park, access roads and power line Project:

**EXIGO-EDP40-SA01 - EXIGO-EDP40-SA12**

<b>NATURE OF IMPACT:</b> Impacts could involve displacement or destruction of Stone Age material in the Eenduin Solar Park, access roads and power line Project area.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>EXTENT</b>	Local	Local
<b>DURATION</b>	Permanent	Permanent
<b>MAGNITUDE</b>	Minor	Minor
<b>PROBABILITY</b>	Definite	Very improbable
<b>SIGNIFICANCE</b>	Low	Low
<b>STATUS</b>	Negative	Neutral
<b>REVERSIBILITY</b>	Non-reversible	Non-reversible

<sup>3</sup> Based on: Winter, S. & Baumann, N. 2005. *Guideline for involving heritage specialists in EIA processes: Edition 1.*

<b>IRREPLACEABLE LOSS OF RESOURCES?</b>	Yes	No
<b>CAN IMPACTS BE MITIGATED?</b>	Yes	
<b>MITIGATION:</b> Site monitoring by Heritage Specialist & ECO.		
<b>CUMULATIVE IMPACTS:</b> No cumulative impact is anticipated.		
<b>RESIDUAL IMPACTS:</b> n/a		

**6.1.3 Discussion: Evaluation of Results and Impacts**

Previous studies conducted in the larger Keimoes area suggest a rich and diverse archaeological landscape and cognisance should be taken of archaeological material that might be present in surface and sub-surface deposits along drainage lines and at water pans. The following impact assessment discussion summarises the extent of heritage significance and impact on resources, cognisant of this rich larger archae-historical landscape.

Stone Age material, most of which date to the MSA occurs across the study area. These numerous low density occurrences (**EXIGO-EDP40-SA01 - EXIGO-EDP40-SA12**) and their cultural context is of low scientific value due to the low frequency of lithics and formal diagnostic tools as well as the general loss of site context. The occurrences are located within demarcated development areas for the Eenduin Solar Park, access roads and power line and the impact thereon by proposed activities is anticipated to be direct and of permanent duration where in essence, the impact will result in the loss of archaeological material. However, the occurrences are of low heritage value and the severity of the anticipated impact is therefore low, provide that the site be monitored by a Heritage Specialist and an ECO.

***Heritage resources of low significance have been documented in the Eenduin Photovoltaic Power Plant footprint areas. However, it is the opinion of the author of this Archaeological Impact Assessment Report that the proposed Eenduin Solar Park, access roads and power line Project on portion 40 of the farm Eenduin will have a very limited impact on archaeological heritage resources. The author is confident that the study has captured adequate information on the archaeological heritage present. The project should be allowed to proceed from a culture resources management perspective, provided that mitigation measures provided in this assessment (monitoring), endorsed by the relevant Heritage Resources authority, are implemented where applicable.***

**6.2 Management actions**

Recommendations for relevant heritage resources management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of the Addendum. The following management measures would be required during implementation of the proposed Eenduin Solar Park, access roads and power line Project.

**OBJECTIVE:** prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

***For the numerous low density MSA occurrences (EXIGO-EDP40-SA01 - EXIGO-EDP40-SA12) the following are required in terms of heritage management and mitigation:***

<b>PROJECT COMPONENT/S</b>	All phases of construction.		
<b>POTENTIAL IMPACT</b>	Damage/disturbance of previously undetected heritage remains.		
<b>ACTIVITY RISK/SOURCE</b>	Digging foundations and trenches into sensitive deposits that are not visible at the surface, have not been detected prior to development.		
<b>MITIGATION: TARGET/OBJECTIVE</b>	To adequately document the historic fabric of previously undetected heritage remains as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
<b>MITIGATION: ACTION/CONTROL</b>	<b>RESPONSIBILITY</b>	<b>TIMEFRAME</b>	
Fixed Mitigation Procedure ( <b>required</b> )			
<b>Site Monitoring:</b> Site inspection by a Stone Age archaeologist familiar with the archaeological sequence of the area in order to monitor possible impacts on Stone Age receptors.	Stone Age archaeologist	At least once during construction phases of the proposed development.	
<b>Site Monitoring:</b> Regular examination of trenches, excavations and other construction areas in order to monitor possible impacts on heritage receptors.	ECO	Monitor as frequently as practically possible.	
<b>PERFORMANCE INDICATOR</b>	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
<b>MONITORING</b>	Successful location of sites by person/s monitoring.		

## 7 RECOMMENDATIONS

The larger landscape around Keimoes and the Orange River Basin is rich in pre-historical and historical remnants, significantly so Stone Age and Colonial Period Heritage. During the site survey, MSA (MSA) material was documented at a number of localities the survey area, some of which near drainage channels and in association with exposed decamping calcrete deposits. The following recommendations are made based on general observations in the proposed Eenduin Solar Park, access roads and power line Project Area:

- A Palaeontological Impact Assessment is recommended for the study area and, should fossil remains such as fossil fish, reptiles or petrified wood be exposed during construction, these objects should carefully safeguarded and the relevant heritage resources authority (SAHRA) should be notified immediately so that the appropriate action can be taken by a professional palaeontologist.
- During this study it was found that cultural material in this landscape occurs in lower lying areas near sources of water and in association with exposed decomposing calcrete horizons. Single MSA lithics (specifically a broken point, a retouched side scraper and a flake tool) were noted along the southern portion of the proposed access road route to the N14 (marked as **EXIGO-EDP40-SA01**). The access road alignment follows an existing gravel road for the largest part and this area has also been adversely altered and disturbed, and the occurrence is of low heritage value due to the loss of artefact context and the low density of the lithic occurrence. A number of low density MSA lithic occurrences (adzes, scrapers, blades, points and worked chunks and flakes) were identified scattered across the proposed Solar Park footprint area (marked as **EXIGO-EDP40-SA02 - EXIGO-EDP40-SA12**). Most of the occurrences are randomly located across the area where precipitation

and groundwater have exposed the stone tools but in some instances lithics appear within a decomposed calcrete rock layer in association with quartzite deposits. The stone implements comprise isolated occurrences that are spread thinly and unevenly over the surrounding landscape. Generally, the occurrences are lacking in context as no organic remains such as bone, pottery or ostrich eggshell was found. The fairly small numbers and isolated context in which they were found means that these archaeological remains have been rated as having low archaeological significance. However, the occurrence of these stone tools strongly suggests that similar sites could be located elsewhere in the study area, potentially sub-surface. This is due to the area's close proximity to the Orange River which renders it is prone to alluvial deposits that could burry potential Stone Age material. It is therefore recommended that a Stone Age archaeologist familiar with the archaeological sequence of the area conduct at least one site inspection during construction phases of the proposed development in order to monitor possible impacts on previously undetected Stone Age receptors in the area. In addition, it is recommended that a careful watching brief monitoring process be implemented whereby an informed ECO inspect the construction sites on regular basis in order to monitor possible impact on previously undetected heritage resources. Should any subsurface paleontological, archaeological or historical material or heritage resources be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

- It is essential that cognisance be taken of the larger archaeological landscape of the area in order to avoid the destruction of previously undetected heritage sites. Should any subsurface paleontological / archaeological / historical material and /or graves/human remains be uncovered, all activities should be suspended and the archaeological specialist should be alerted immediately.
- It should be noted that mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).

In addition to these site-specific recommendations, careful cognisance should be taken of the following:

- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.
- Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits.

## 8 GENERAL COMMENTS AND CONDITIONS

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This AIA report serves to confirm the extent and significance of the heritage landscape of the proposed Eenduin Solar Park, access roads and power line Project Development area. The larger heritage horizon encompasses rich and diverse archaeological landscapes and cognisance should be taken of heritage resources and archaeological material that might be present in surface and sub-surface deposits. If, during construction, any possible archaeological material culture discoveries are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. Such material culture might include:

- Formal Earlier Stone Age stone tools.
- Formal MSA stone tools.
- Formal LSA stone tools.



- Potsherds
- Iron objects.
- Beads made from ostrich eggshell and glass.
- Ash middens and cattle dung deposits and accumulations.
- Faunal remains.
- Human remains/graves.
- Stone walling or any sub-surface structures.
- Historical glass, tin or ceramics.
- Fossils.

If such site were to be encountered or impacted by any proposed developments, recommendations contained in this report, as well as endorsement of mitigation measures as set out by AMAFA, SAHRA, the National Resources Act and the CRM section of ASAPA will be required.

It must be emphasised that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not therefore, represent the area's complete archaeological legacy. Many sites/features may be covered by soil and vegetation and might only be located during sub-surface investigations. If subsurface archaeological deposits, artefacts or skeletal material were to be recovered in the area during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately (**cf. NHRA (Act No. 25 of 1999)**, Section 36 (6)). It must also be clear that Archaeological Specialist Reports will be assessed by the relevant heritage resources authority (SAHRA).

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*Accessed 2015-02-15*

**10 ADDENDUM 1: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE**

**10.1 Site Significance Matrix**

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by its aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these. The following matrix is used for assessing the significance of each identified site/feature.

2. SITE EVALUATION			
2.1 Heritage Value (NHRA, section 2 [3])	High	Medium	Low
It has importance to the community or pattern of South Africa’s history or pre-colonial history.			
It possesses unique, uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage.			
It has potential to yield information that will contribute to an understanding of South Africa’s natural and cultural heritage.			
It is of importance in demonstrating the principle characteristics of a particular class of South Africa’s natural or cultural places or objects.			
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.			
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.			
It has marked or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).			
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.			
It has significance through contributing towards the promotion of a local sociocultural identity and can be developed as a tourist destination.			
It has significance relating to the history of slavery in South Africa.			
It has importance to the wider understanding of temporal changes within cultural landscapes, settlement patterns and human occupation.			
2.2 Field Register Rating			
National/Grade 1 [should be registered, retained]			
Provincial/Grade 2 [should be registered, retained]			
Local/Grade 3A [should be registered, mitigation not advised]			
Local/Grade 3B [High significance; mitigation, partly retained]			
Generally Protected A [High/Medium significance, mitigation]			
Generally protected B [Medium significance, to be recorded]			
Generally Protected C [Low significance, no further action]			
2.3 Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Local			
Specific community			

**10.2 Impact Assessment Criteria**

The following table provides a guideline for the rating of impacts and recommendation of management actions for sites of heritage potential.

**Significance of the heritage resource**

This is a statement of the nature and degree of significance of the heritage resource being affected by the activity. From a heritage management perspective it is useful to distinguish between whether the significance is embedded in the physical fabric or in associations with events or persons or in the experience of a place; i.e. its visual and non-visual qualities. This statement is a primary informant to the nature and degree of significance of an impact and thus needs to be thoroughly considered. Consideration needs to be given to the significance of a heritage resource at different scales (i.e. sitespecific, local, regional, national or international) and the relationship between the heritage resource, its setting and its associations.

**Nature of the impact**

This is an assessment of the nature of the impact of the activity on a heritage resource, with some indication of its positive and/or negative effect/s. It is strongly informed by the statement of resource significance. In other words, the nature of the impact may be historical, aesthetic, social, scientific, linguistic or architectural, intrinsic, associational or contextual (visual or non-visual). In many cases, the nature of the impact will include more than one value.

**Extent**

Here it should be indicated whether the impact will be experienced:

- On a site scale, i.e. extend only as far as the activity;
- Within the immediate context of a heritage resource;
- On a local scale, e.g. town or suburb
- On a metropolitan or regional scale; or
- On a national/international scale.

**Duration**

Here it should be indicated whether the lifespan of the impact will be:

- Short term, (needs to be defined in context)
- Medium term, (needs to be defined in context)
- Long term where the impact will persist indefinitely, possibly beyond the operational life of the activity, either because of natural processes or by human intervention; or
- Permanent where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Of relevance to the duration of an impact are the following considerations:

- Reversibility of the impact; and
- Renewability of the heritage resource.

**Intensity**

Here it should be established whether the impact should be indicated as:

- Low, where the impact affects the resource in such a way that its heritage value is not affected;
- Medium, where the affected resource is altered but its heritage value continues to exist albeit in a modified way; and
- High, where heritage value is altered to the extent that it will temporarily or permanently be damaged or destroyed.

**Probability**

This should describe the likelihood of the impact actually occurring indicated as:

- Improbable, where the possibility of the impact to materialize is very low either because of design or historic experience;
- Probable, where there is a distinct possibility that the impact will occur;
- Highly probable, where it is most likely that the impact will occur; or
- Definite, where the impact will definitely occur regardless of any mitigation measures

**Confidence**

This should relate to the level of confidence that the specialist has in establishing the nature and degree of impacts. It relates to the level and reliability of information, the nature and degree of consultation with I&AP's and the dynamic of the broader socio-political context.

- High, where the information is comprehensive and accurate, where there has been a high degree of consultation and the socio-political context is relatively stable.

- Medium, where the information is sufficient but is based mainly on secondary sources, where there has been a limited targeted consultation and socio-political context is fluid.
- Low, where the information is poor, a high degree of contestation is evident and there is a state of socio-political flux.

**Impact Significance**

The significance of impacts can be determined through a synthesis of the aspects produced in terms of the nature and degree of heritage significance and the nature, duration, intensity, extent, probability and confidence of impacts and can be described as:

- Low; where it would have a negligible effect on heritage and on the decision
- Medium, where it would have a moderate effect on heritage and should influence the decision.
- High, where it would have, or there would be a high risk of, a big effect on heritage. Impacts of high significance should have a major influence on the decision;
- Very high, where it would have, or there would be high risk of, an irreversible and possibly irreplaceable negative impact on heritage. Impacts of very high significance should be a central factor in decision-making.

**10.3 Direct Impact Assessment Criteria**

The following table provides an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected

HERITAGE CONTEXT	TYPE OF DEVELOPMENT			
	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
<b>CONTEXT 1</b> High heritage Value	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected	Very high heritage impact expected
<b>CONTEXT 2</b> Medium to high heritage value	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected
<b>CONTEXT 3</b> Medium to low heritage value	Little or no heritage impact expected	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected
<b>CONTEXT 4</b> Low to no heritage value	Little or no heritage impact expected	Little or no heritage impact expected	Minimal heritage value expected	Moderate heritage impact expected

**NOTE: A DEFAULT "LITTLE OR NO HERITAGE IMPACT EXPECTED" VALUE APPLIES WHERE A HERITAGE RESOURCE OCCURS OUTSIDE THE IMPACT ZONE OF THE DEVELOPMENT.**

HERITAGE CONTEXTS	CATEGORIES OF DEVELOPMENT
<p><b>Context 1:</b> Of high intrinsic, associational and contextual heritage value within a national, provincial and local context, i.e. formally declared or potential Grade 1, 2 or 3A heritage resources</p> <p><b>Context 2:</b> Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.</p> <p><b>Context 3:</b> Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources</p> <p><b>Context 4:</b> Of little or no intrinsic, associational or contextual heritage value due to disturbed, degraded conditions or extent of irreversible damage.</p>	<p><b>Category A: Minimal intensity development</b></p> <ul style="list-style-type: none"> <li>- No rezoning involved; within existing use rights.</li> <li>- No subdivision involved.</li> <li>- Upgrading of existing infrastructure within existing envelopes</li> <li>- Minor internal changes to existing structures</li> <li>- New building footprints limited to less than 1000m2.</li> </ul> <p><b>Category B: Low-key intensity development</b></p> <ul style="list-style-type: none"> <li>- Spot rezoning with no change to overall zoning of a site.</li> <li>- Linear development less than 100m</li> <li>- Building footprints between 1000m2-2000m2</li> <li>- Minor changes to external envelop of existing structures (less than 25%)</li> <li>- Minor changes in relation to bulk and height of immediately adjacent structures (less than 25%).</li> </ul> <p><b>Category C: Moderate intensity development</b></p> <ul style="list-style-type: none"> <li>- Rezoning of a site between 5000m2-10 000m2.</li> </ul>

	<ul style="list-style-type: none"> <li>- Linear development between 100m and 300m.</li> <li>- Building footprints between 2000m2 and 5000m2</li> <li>- Substantial changes to external envelop of existing structures (more than 50%)</li> <li>- Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 50%)</li> </ul> <p><b>Category D: High intensity development</b></p> <ul style="list-style-type: none"> <li>- Rezoning of a site in excess of 10 000m2</li> <li>- Linear development in excess of 300m.</li> <li>- Any development changing the character of a site exceeding 5000m2 or involving the subdivision of a site into three or more erven.</li> <li>- Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 100%)</li> </ul>
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### 10.4 Management and Mitigation Actions

The following table provides a guideline of relevant heritage resources management actions is vital to the conservation of heritage resources.

<p><b>No further action / Monitoring</b></p> <p>Where no heritage resources have been documented, heritage resources occur well outside the impact zone of any development or the primary context of the surroundings at a development footprint has been largely destroyed or altered, no further immediate action is required. Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation in order to ensure that no undetected heritage\ remains are destroyed.</p> <p><b>Avoidance</b></p> <p>This is appropriate where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. Mitigation is not acceptable or not possible. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.</p> <p><b>Mitigation</b></p> <p>This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated to a degree of medium to low significance, e.g. the high to medium impact of a development on an archaeological site could be mitigated through sampling/excavation of the remains. Not all negative impacts can be mitigated.</p> <p><b>Compensation</b></p> <p>Compensation is generally not an appropriate heritage management action. The main function of management actions should be to conserve the resource for the benefit of future generations. Once lost it cannot be renewed. The circumstances around the potential public or heritage benefits would need to be exceptional to warrant this type of action, especially in the case of where the impact was high.</p> <p><b>Rehabilitation</b></p> <p>Rehabilitation is considered in heritage management terms as a intervention typically involving the adding of a new heritage layer to enable a new sustainable use. It is not appropriate when the process necessitates the removal of previous historical layers, i.e. restoration of a building or place to the previous state/period. It is an appropriate heritage management action in the following cases:</p> <ul style="list-style-type: none"> <li>- The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.</li> <li>- Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric.</li> <li>- Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource.</li> </ul> <p><b>Enhancement</b></p> <p>Enhancement is appropriate where the overall heritage significance and its public appreciation value are improved. It does not imply creation of a condition that might never have occurred during the evolution of a place, e.g. the tendency to sanitize the past. This management action might result from the removal of previous layers where these layers are culturally of low significance and detract from the significance of the resource. It would be appropriate in a range of heritage contexts and applicable to a range of resources. In the case of formally protected or significant resources, appropriate enhancement action should be encouraged. Care should, however, be taken to ensure that the process does not have a negative impact on the character and context of the resource. It would thus have to be carefully monitored</p>
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