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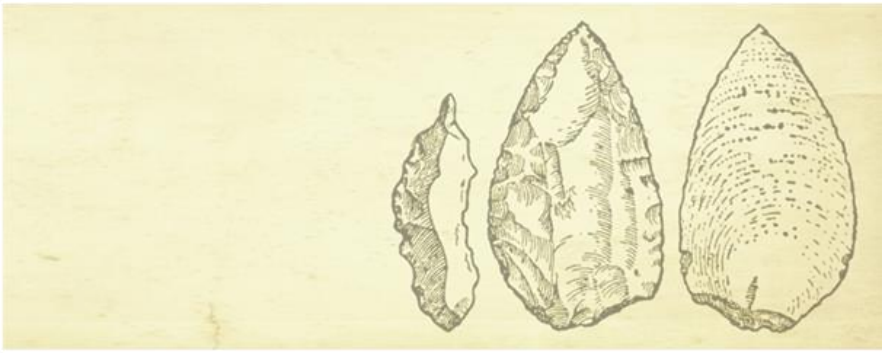

PHASE 1 HIA AGRICULTURAL DEVELOPMENT, ERF 1375 AND 1372, GROBLERSHOOP

PROPOSED AGRICULTURAL DEVELOPMENT ON ERF 1375 AND 1372, GROBLERSHOOP, !KHEIS LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE.

PREPARED FOR:
ENVIROAFRICA CC

PREPARED BY:
SKY-LEE FAIRHURST & JAN ENGELBRECHT
HEIDI FIVAZ & ELIZE BUTLER
UBIQUE HERITAGE CONSULTANTS

04 SEPTEMBER 2023

Web: www.ubiquecrm.com **Mail**: info@ubiquecrm.com
CSD Supplier Number MAAA0586123

CLIENT:	**EnviroAfrica CC** www.enviroafrica.co.za
CONTACT PERSON:	**Bernard de Witt** E-mail: bernard@enviroafrica.co.za
HERITAGE CONSULTANT:	**UBIQUE Heritage Consultants** www.ubiquecrm.com info@ubiquecrm.com
CONTACT PERSON:	**Sky-Lee Fairhurst** (archaeologist) Member of the Association of Southern African Professional Archaeologists: Member number: 541 Email: sky@ubiquecrm.com **Heidi Fivaz** (archaeologist) Member of the Association of Southern African Professional Archaeologists: Member number: 433 Email: heidi@ubiquecrm.com **Jan Engelbrecht** (archaeologist and lead CRM specialist) Member of the Association of Southern African Professional Archaeologists: Member number: 297 Email: jan@ubiquecrm.com

Declaration of independence:

UBIQUE Heritage Consultants hereby confirm our independence as heritage specialists and declare that:

- we are suitably qualified and accredited to act as independent specialists in this application;
- we do not have any vested interests (either business, financial, personal or other) in the proposed development project other than remuneration for the heritage assessment and heritage management services performed;
- the work was conducted in an objective and ethical manner, in accordance with a professional code of conduct and within the framework of South African heritage legislation.

Signed: **Date: 2023-09-04**

J.A.C. Engelbrecht, H. Fivaz & S. Fairhurst

UBIQUE Heritage Consultants

SUMMARY OF SPECIALIST EXPERTISE

SKY-LEE FAIRHURST

ARCHAEOLOGIST & ARCHAEOLOGICAL ILLUSTRATOR

Sky-Lee Fairhurst has been part of UBIQUE Heritage Consultants since 2019 and became a director in 2023. Miss Fairhurst obtained her BA in Archaeology and Biblical archaeology in 2016 and her BA Hons in Archaeology (cum laude) at the University of South Africa (UNISA) in 2018, focussing on research themes of gender, households and Late Iron Age settlements. She successfully attained her MA in Archaeology from UNISA in 2023. She is skilled at artefacts and archaeological illustrations. Over the past ten years, she has obtained considerable excavation and survey experience and worked on various sites, including Historical, Iron Age, and Palaeontological sites.

JAN ENGELBRECHT

CRM ARCHAEOLOGIST

Jan Engelbrecht is accredited by the Cultural Resources Management section of the Association of Southern African Professional Archaeologists (ASAPA) to undertake Phase 1 AIAs and HIAs in South Africa. He is also a member of the Association for Professional Archaeologists (ASAPA). Mr Engelbrecht holds an honours degree in archaeology (specialising in the history of early farmers in southern Africa (Iron Age) and the Colonial period) from the University of South Africa. He has 12 years of experience in heritage management. He has worked on projects as diverse as the Zulti South HIA of Richards Bay Minerals, research on the David Bruce heritage site at Ubombo in Kwa-Zulu Natal, and various archaeological excavations and historical archaeological projects. He has worked with many rural communities to establish integrated heritage and land use plans and speaks Zulu fluently. Mr Engelbrecht established Ubique Heritage Consultants in 2012. The company moved from KZN to the Northern Cape and is currently based at Askham in the Northern Cape within the Mier local municipality in the Kgalagadi region. He had a significant military career as an officer; whereafter he qualified as an Animal Health Technician at Technikon RSA and UNISA. He is currently studying for his MA Degree in Archaeology.

HEIDI FIVAZ

CRM ARCHAEOLOGIST & OBJECT CONSERVATOR

Heidi Fivaz has been a part of UBIQUE Heritage Consultants since 2016 and took over ownership in 2018. She is responsible for project management, surveys, research and report compilation. She holds a B.Tech. Fine Arts degree (2000) from the Tshwane University of Technology, a BA in Culture and Arts Historical Studies degree (2012) from UNISA and received her BA (Hons) in Archaeology in 2015 (UNISA). She has received extensive training in object conservation from the South African Institute of Object Conservation and specialises in glass and ceramics conservation. She is also a skilled artefact and archaeological illustrator. Ms Fivaz was awarded her MA in Archaeology (with distinction) in 2021 by the University of South Africa (UNISA), focusing on historical and industrial archaeology. She is a professional member of the Association of South African Archaeologists and has worked on numerous archaeological excavation and surveying projects over the past thirteen years. Ms Fivaz is an accredited CRM Field Director.

EXECUTIVE SUMMARY

Project description

UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA) to conduct a cultural heritage assessment to determine the impact of the proposed agricultural development on Erf 1375 and 1372, Groblershoop, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province, on any sites, features, or objects of cultural heritage significance.

Findings and Impact on Heritage Resources

Several historical period resources were identified during the survey for the proposed agricultural development on Erf 1375 and 1372. These resources include middens, stone structures, and a hole-in-cap tin (GH004, 007, 008, 010 011, 012 and 013). Based on the cultural material found, the midden at waypoint GH004 can be dated from 1950 to 2000s, while GH008 is dated from 1930 to 1960, GH012 is dated to 1920 to 1950, and GH013 is from 1920s to 2000s. The structural features (GH007) date between 1930s to 1960 and (GH011) between 1920s and 1950s.

GH004, 010 and 013 have been rated **General Protection IVC. They are considered low significance, and no further mitigation is required**. The structural features and middens recorded at GH007, 008, 011, and 012 have been given a General protection IVB field rating**. They are considered medium significance, must be recorded, and require a permit before destruction.**

Moreover, a modern house ruin was identified (GH001 - 28° 44' 22.1" S 21° 51' 19.6" E). Although this structure is modern, it is evident from the cultural material and other structural features nearby that the area was occupied during historical times. This structure is considered to be Non-Conservation worthy.

No other cultural material relating to the Stone Age or agri-pastoral farming communities' period resources were identified.

Superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation (Kalahari Group) underlies the development. The updated geology of the area indicates that the Groblershoop Formation of the Brulpan Group underlies the proposed development. The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (Almond et al., 2013; SAHRIS website), while the suggested location is classified as having a Medium Palaeontology Theme

Sensitivity in the DEA Screening Report. A Low Palaeontological Significance has been allocated to the proposed development (Butler 2023 Appendix A).

Recommendations

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

1. The historic period resources identified (GH004, 010 and 013) that have been given a field rating of IVC are considered low significance and sufficiently recorded. These cultural resources are of **low significance and therefore considered not to be conservation worthy. No further mitigation is recommended concerning these resources.**

2. The two structural features and associated middens (GH007, 008, 011 and 012) have been given a field rating of IVB. These resources are of **medium significance** and will be impacted **negatively by development. Therefore, they need to be recorded and require a permit from the Northern Cape Provincial Heritage Authority (NBKB) before destruction. Alternatively, a 30 m buffer zone can be implemented.**

3. The modern structure and associated material are considered **Non-Conservation Worthy,** as it is not older than 60 years and therefore has **no archaeological/cultural significance. No mitigation is required.**

4. Due to the **low palaeontological significance** of the proposed development, it is considered that the proposed development will not negatively impact the area's palaeontological resources. Therefore**, in terms of palaeontology, the proposed development may continue**. It is, however, recommended that if fossil remains or traces are discovered during any phase of construction, either on the surface or exposed by excavations, the Chance Find Protocol must be implemented by the ECO or site manager in charge of these developments (Butler 2023).

5. Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi

Tshivhase/Mimi Seetelo 012 320 8490) must be alerted immediately as per section 36(6) of the NHRA. Depending on the nature of the finds, a professional archaeologist or palaeontologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources are of archaeological or palaeontological significance, a Phase 2 rescue operation may be required, subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred due to such oversights.

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ABBREVIATIONS

AIA:	Archaeological Impact Assessment
ASAPA:	Association of South African Professional Archaeologists
CRM:	Cultural Resource Management
EIA:	Early Iron Age
EMP:	Environmental Management Plan
ESA:	Earlier Stone Age
GPS:	Global Positioning System
HIA:	Heritage Impact Assessment
HWC:	Heritage Western Cape
IA:	Iron Age
IMP:	Integrated Management Plan
LSA:	Later Stone Age
MIA:	Middle Iron Age
MSA:	Middle Stone Age
NBKB:	Ngwao-Boswa Jwa Kapa Bokone (Northern Cape PHRA)
NHRA:	National Heritage Resources Act
PHRA:	Provincial Heritage Resource Agency
SADC:	Southern African Development Community
SAHRA:	South African Heritage Resources Agency
SAHRIS:	South African Heritage Resources Information System

GLOSSARY

Archaeological:	Material remains resulting from human activity in a state of disuse, older than 100 years, including artefacts, human and hominid remains and artificial features and structures.
Historic building:	Structures 60 years and older.
Heritage:	That which is inherited and forms part of the National Estate (historic places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).
Heritage resources:	Valuable, finite, non-renewable and irreplaceable resources that provide evidence of the origins of South African society
Mitigation:	Anticipating and preventing adverse impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.
'Public monuments:	All monuments and memorials, erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or – which were paid for by public subscription, government funds, or a public-spirited or military organisation and are on land belonging to any private individual.
'Structures':	Any building, works, device or other facility made by people, and which are fixed to land, and include any fixtures, fittings and equipment associated therewith.

1. INTRODUCTION

1.1 Scope of study

The project involves proposed agricultural development on erf 1375 and 1372, Groblershoop, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. UBIQUE Heritage Consultants were appointed by EnviroAfrica CC as independent heritage specialists in accordance with the National Environmental Management Act 107 of 1998 (NEMA) and in compliance with Section 38 of the National Heritage Resources Act 25 of 1999 (NHRA) to conduct a cultural heritage assessment (AIA/HIA) of the development area.

The assessment aims to identify and report any heritage resources that may fall within the development footprint; to determine the impact of the proposed development on any sites, features, or objects of cultural heritage significance; to assess the significance of any identified resources; and to assist the developer in managing the documented heritage resources in an accountable manner, within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

South Africa's heritage resources are rich and widely diverse, encompassing sites from all periods of human history. Resources may be tangible, such as buildings and archaeological artefacts, or intangible, such as landscapes and living heritage. Their significance is based on their aesthetic, architectural, historical, scientific, social, spiritual, linguistic, economic or technological values; their representation of a time or group; their rarity; and their sphere of influence.

Natural (e.g. erosion) and human (e.g. development) activities can jeopardise the integrity and significance of heritage resources. In the case of human activities, a range of legislation exists to ensure the timeous and accurate identification and effective management of heritage resources for present and future generations.

The result of this investigation is presented within this heritage impact assessment report. It comprises the recording of heritage resources present/ absent and offers recommendations for managing these resources within the context of the proposed development.

Depending on SAHRA's acceptance of this report, the developer will receive permission to proceed with the proposed development, considering any proposed mitigation measures.

1.2 Assumptions and limitations

It is assumed that the description of the proposed project, as provided by the client, is accurate. Furthermore, it is assumed that the public consultation process undertaken as part of the Environmental Impact Assessment (EIA) is comprehensive and does not have to be repeated as part of the heritage impact assessment.

The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and any site is evaluated with reference to any number of these aspects. Cultural significance is site-specific and relates to the content and context of the site.

The comprehensive field survey and intensive desktop study have taken all possible care to identify sites of cultural importance within the development areas. However, it is essential to note that some heritage sites may have been missed due to their subterranean nature or dense vegetation cover. No subsurface investigation (i.e. excavations or sampling) was undertaken since a SAHRA permit is required for such activities. Therefore, should any heritage features and/or objects such as architectural features, stone tool scatters, artefacts, human remains, or fossils be uncovered or observed during construction, operations must be stopped, and a qualified archaeologist must be contacted to assess the find. Observed or located heritage features and/or objects may not be disturbed or removed in any way until the heritage specialist has been able to assess the significance of the site (or material) in question.

2. TERMS OF REFERENCE

2.1 Statutory Requirements

2.1.1 General

The principle is that the environment should be protected for present and future generations by preventing pollution, promoting conservation and practising ecologically sustainable development. With regard to spatial planning and related legislation at national and provincial levels, the following legislation may be relevant:

- Physical Planning Act 125 of 1991
- Municipal Structures Act 117 of 1998
- Municipal Systems Act 32 of 2000
- Development Facilitation Act 67 of 1995 (DFA)

The identification, evaluation and management of heritage resources in South Africa are required and governed by the following legislation:

- National Environmental Management Act 107 of 1998 (NEMA)
- KwaZulu-Natal Heritage Act 4 of 2008 (KZNHA)
- National Heritage Resources Act 25 of 1999 (NHRA)
- Minerals and Petroleum Resources Development Act 28 of 2002 (MPRDA)

2.1.2 National Heritage Resources Act 25 of 1999

The NHRA established the South African Heritage Resources Agency (SAHRA) together with its Council to fulfil the following functions:

- coordinate and promote the management of heritage resources at the national level;
- set norms and maintain essential national standards for the management of heritage resources in the Republic and to protect heritage resources of national significance;
- control the export of nationally significant heritage objects and the import into the Republic of cultural property illegally exported from foreign countries;
- enable the provinces to establish heritage authorities which must adopt powers to protect and manage certain categories of heritage resources; and
- provide for local authorities' protection and management of conservation-worthy places and areas.

2.1.3 Heritage Impact Assessments/Archaeological Impact Assessments

Section 38(1) of the NHRA of 1999 requires **the responsible heritage resources authority to notify the person who intends to undertake a development that fulfils the following criteria to submit an impact assessment report if there is reason to believe that heritage resources will be affected by such event**:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- the construction of a bridge or similar structure exceeding 50m in length;
- any development or other activity that will change the character of a site—
    - exceeding 5000m² in extent; or
    - involving three or more existing erven or subdivisions thereof; or
    - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- the rezoning of a site exceeding 10 000m² in extent; or
- any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

2.1.5 Management of Graves and Burial Grounds

- **Graves younger than 60 years** are protected in terms of Section 2(1) of the Removal of Graves and Dead Bodies Ordinance 7 of 1925 as well as the Human Tissues Act 65 of 1983.

- **Graves older than 60 years, situated outside a formal cemetery administered by a local Authority are** protected in terms of Section 36 of the NHRA as well as the Human Tissues Act of 1983. Accordingly, such graves are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of NHRA) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

The **protocol for the management of graves older than 60 years situated outside a formal cemetery administered by a local authority** is detailed in Section 36 of the NHRA:

> (3) *(a)* No person may, without a permit issued by SAHRA or a provincial heritage resources authority—
>
> *(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; or
>
> *(c)* bring onto or use at a burial ground or grave referred to in paragraph *(a)* or *(b)* any excavation equipment, or any equipment which assists in the detection or recovery of metals.
>
> (4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)*(a)* unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation

and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

(5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection (3)*(b)* unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority—

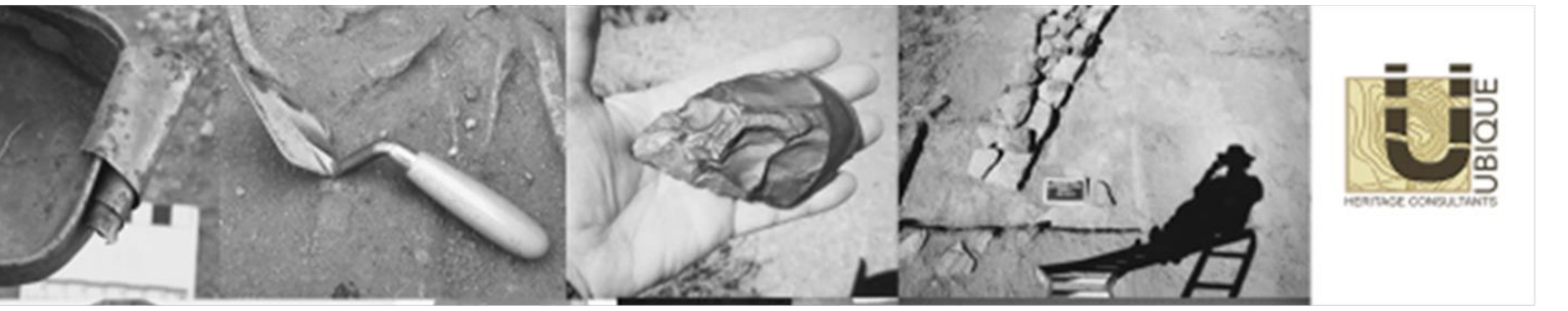
(a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and

(b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.

(6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in cooperation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority—

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

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



3. STUDY APPROACH AND METHODOLOGY

3.1 Desktop study

The first step in the methodology was to conduct a desktop study of the heritage background of the area and the proposed development site. This entailed scoping and scanning historical texts/records, previous heritage studies, and research around the study area.

The study area is contextualised by incorporating data from previous CRM reports in the area and an archival search. The objective is to extract data and information on the area in question, looking at archaeological sites, historical sites and graves.

No archaeological site data was available for the project area. A concise account of the archaeology and history of the broader study area was compiled (sources listed in the bibliography).

3.1.1 Literature review

A literature survey was undertaken to obtain background information regarding the area. Through researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that several other archaeological or historical studies had been performed within the broader vicinity of the study area. Sources consulted in this regard are indicated in the bibliography.

3.2 Field study

Phase 1 (AIA/HIA) requires the completion of a field study to establish and ensure the following:

3.2.1 Systematic survey

A systematic survey of the proposed project area was completed to locate, identify, record, photograph, and describe archaeological, historical or cultural interest sites.

UBIQUE Heritage Consultants inspected the proposed development and surrounding areas on the **24th and 25th of July 2023** and completed a controlled-exclusive, pre-planned pedestrian and vehicular survey. We inspected the ground's surface, wherever the surface was visible. This was done with no substantial attempt to clear brush, sand, deadfall, leaves or other material that may cover the surface. In addition, cut banks and other exposures were fortuitously observed without looking beneath the surface beyond inspecting rodent burrows.

The survey was tracked with a handheld Garmin global positioning unit (Garmin eTrex 10).

3.2.2 Recording significant areas

GPS points of identified significant areas were recorded with a handheld Garmin global positioning unit (Garmin eTrex 10). Photographs were taken with a Canon IXUS 185 20-megapixel camera. Detailed field notes were taken to describe observations. The layout of the area and plotted GPS points, tracks and coordinates were transferred to Google Earth, and QGIS and maps were created.

3.2.3 Definitions of heritage resources

The NHRA defines a heritage resource as any place or object of cultural significance, i.e., aesthetic, architectural, historical, scientific, social, spiritual, linguistic, or technological value or significance. These include, but are not limited to, the following wide range of places and objects:

- living heritage as defined in the National Heritage Council Act No 11 of 1999 (cultural tradition; oral history; performance; ritual; popular memory; skills and techniques; indigenous knowledge systems; and the holistic approach to nature, society and social relationships);
- Ecofacts (non-artefactual organic or environmental remains that may reveal aspects of past human activity; definition used in KwaZulu-Natal Heritage Act 2008);
- places, buildings, structures and equipment;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds;
- public monuments and memorials;
- sites of significance relating to the history of slavery in South Africa;
- movable objects, but excluding any object made by a living person; and
- battlefields.

3.3 Determining significance

Heritage resources are considered of value if the following criteria apply:

a.	It is important in the community or pattern of South Africa's history;
b.	It has uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
c.	It has the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
d.	It is vital in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
e.	It exhibits particular aesthetic characteristics valued by a community or cultural group;

f.	It is essential in demonstrating a high degree of creative or technical achievement at a particular period;
g.	It has a strong or unique association with a particular community or cultural group for social, cultural or spiritual reasons;
h.	It has a strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
i.	It is of significance relating to the history of slavery in South Africa.

Levels of significance of the various types of heritage resources observed and recorded are determined by the following criteria:

CULTURAL & HERITAGE SIGNIFICANCE	
LOW	A cultural object found out of context, not part of a site or without any related feature/structure in its surroundings.
MEDIUM	Any site, structure or feature is regarded as less important due to several factors, such as date, frequency and uniqueness. Likewise, any important object found out of context.
HIGH	Any site, structure or feature is regarded as important because of its age or uniqueness. Graves are always categorised as of a high importance. Likewise, any important object found within a specific context.

Field Ratings or Gradings are assigned to indicate the level of protection required and who is responsible for national, provincial, or local protection.

FIELD RATINGS & GRADINGS	
National Grade I	Heritage resources with exceptional qualities to the extent that they are of national significance and should therefore be managed as part of the national estate.
Provincial Grade II	Heritage resources with qualities provincial or regional importance, although it may form part of the national estate, it should be managed as part of the provincial estate.
Local Grade IIIA	Heritage resources are of local importance and worthy of conservation. Therefore, it should be included in the heritage register and not be mitigated (high significance).
Local Grade IIIB	Heritage resources are of local importance and worthy of conservation. Therefore, it should be included in the heritage register and mitigated (high/ medium significance).
	The site/resource should be mitigated before destruction (high/ medium significance).

FIELD RATINGS & GRADINGS	
General Protection Grade IVA	
General protection Grade IVB	The site/resource should be recorded before destruction (medium significance).
General protection Grade IVC	Phase 1 is considered as sufficient recording, and it may be demolished (low significance).

3.3.1 Assessment of development impacts

A heritage resource impact may be defined broadly as the net change, either beneficial or adverse, between the integrity of a heritage site with and without the proposed development. Beneficial impacts occur wherever a proposed development actively protects, preserves, or enhances a heritage resource by minimising natural site erosion or facilitating non-destructive public use. More commonly, development impacts are of an adverse nature and can include:

- destruction or alteration of all or part of a heritage site;
- isolation of a site from its natural setting; and / or
- introduction of physical, chemical or visual elements out of character with the heritage resource and its setting.

Beneficial and adverse impacts can be direct or indirect and cumulative, as implied by the examples. Although indirect impacts may be more difficult to foresee, assess and quantify, they must form part of the assessment process. Therefore, the following assessment criteria have been used to assess the impacts of the proposed development on possible identified heritage resources:

CRITERIA	RATING SCALES	NOTES
Nature	POSITIVE	An evaluation of the type of effect the construction, operation and management of the proposed development would have on the heritage resource.
	NEGATIVE	
	NEUTRAL	
Extent	LOW	Site-specific affects only the development footprint.
	MEDIUM	Local (limited to the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius);
	HIGH	Regional (beyond a 10 km radius) to national.

CRITERIA	RATING SCALES	NOTES
Duration	LOW	0-4 years (i.e. duration of construction phase).
	MEDIUM	5-10 years.
	HIGH	More than 10 years to permanent.
Intensity	LOW	Where the impact affects the heritage resource in such a way that its significance and value are minimally affected.
	MEDIUM	Where the heritage resource is altered, and its significance and value are measurably reduced.
	HIGH	Where the heritage resource is altered or destroyed to the extent that its significance and value cease to exist.
Potential for impact on irreplaceable resources	LOW	No irreplaceable resources will be impacted.
	MEDIUM	Resources that will be impacted can be replaced, with effort.
	HIGH	There is no potential for replacing a particular vulnerable resource that will be impacted.
Consequence	LOW	A combination of any of the following: • Intensity, duration, extent and impact on irreplaceable resources are all rated low. • Intensity is low and up to two of the other criteria are rated medium. • - Intensity is medium, and all three other criteria are rated low.
	MEDIUM	Intensity is medium, and at least two of the other criteria are rated medium.
	HIGH	Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration. Intensity is rated high, with all the other criteria being rated medium or higher.
Probability (the likelihood of the impact occurring)	LOW	It is highly unlikely or less than 50 % likely that an impact will occur.
	MEDIUM	It is between 50 and 70 % certain that the impact will occur.
	HIGH	It is more than 75 % certain that the impact will occur, or it is definite that the impact will occur.
Significance (all impacts including potential cumulative impacts)	LOW	Low consequence and low probability. Low consequence and medium probability. Low consequence and high probability.
	MEDIUM	Medium consequence and low probability. Medium consequence and medium probability. Medium consequence and high probability. High consequence and low probability.

CRITERIA	RATING SCALES	NOTES
	HIGH	High consequence and medium probability. High consequence and high probability.

3.4 Report

The desktop research and field survey results are compiled in this report. The identified heritage resources and anticipated direct, indirect, and cumulative impacts of the proposed project's development on the identified heritage resources will be presented objectively. Alternatives are offered if any significant sites are impacted adversely by the proposed project. All efforts will be made to ensure that all studies, assessments, and results comply with the relevant legislation, code of ethics, Association of South African Professional Archaeologists (ASAPA) guidelines and SAHRA. The report aims to assist the developer in managing the documented heritage resources in a responsible manner and protecting, preserving, and developing them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

4. PROJECT OVERVIEW

UBIQUE Heritage Consultants were appointed by EnviroAfrica CC as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA) to conduct a cultural heritage assessment to determine the impact of the proposed agricultural development on Erf 1375 and 1372, Groblershoop, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.

4.1 Technical information

PROJECT DESCRIPTION	
Project name	Phase 1 HIA Proposed agricultural development on Erf 1375 and 1372, Groblershoop, Northern Cape.
Description	Phase 1 HIA proposed agricultural development on Erf 1375 and 1372, Groblershoop, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.
DEVELOPER	
Dirk Louw: Silver Moon Investments 358 CC	
Development type	Agricultural/Vineyard development
LANDOWNER	
Dirk Louw: Silver Moon Investments 358 CC	
CONSULTANTS	
Environmental	EnviroAfrica CC
Heritage and archaeological	UBIQUE Heritage Consultants
Palaeontological	Banzai Environmental
PROPERTY DETAILS	
Province	Northern Cape
District municipality	ZF Mcgawu
Local municipality	!Kheis
Topo-cadastral map	1:50 000 2821DB
Farm name	ERF NO. 1375 ERF NO. 1372
Closest town	Groblershoop
GPS Co-ordinates	28° 44' 22.1" S 21° 51' 19.6" E
PROPERTY SIZE	116 ha
DEVELOPMENT FOOTPRINT SIZE	14,8 ha
LAND USE	
Previous	Agriculture

Current	Agriculture
Rezoning required	No
Sub-division of land	No

DEVELOPMENT CRITERIA IN TERMS OF SECTION 38(1) NHRA	YES/NO
Construction of a road, wall, power line, pipeline, canal or other linear forms of development or barrier exceeding 300m in length.	Yes
Construction of bridge or similar structure exceeding 50m in length.	No
Construction exceeding 5000m ².	Yes
Development involving three or more existing erven or subdivisions.	No
Development involving three or more erven or divisions that have been consolidated within the past five years.	No
Rezoning of site exceeding 10 000m ².	No
Any other development category, public open space, squares, parks, recreation grounds.	No

Figure 1 *Regional locality of the development footprint, indicated on Google Earth Satellite imagery.*

Figure 2 *Regional locality of the development footprint, indicated on Google Earth Satellite imagery.*

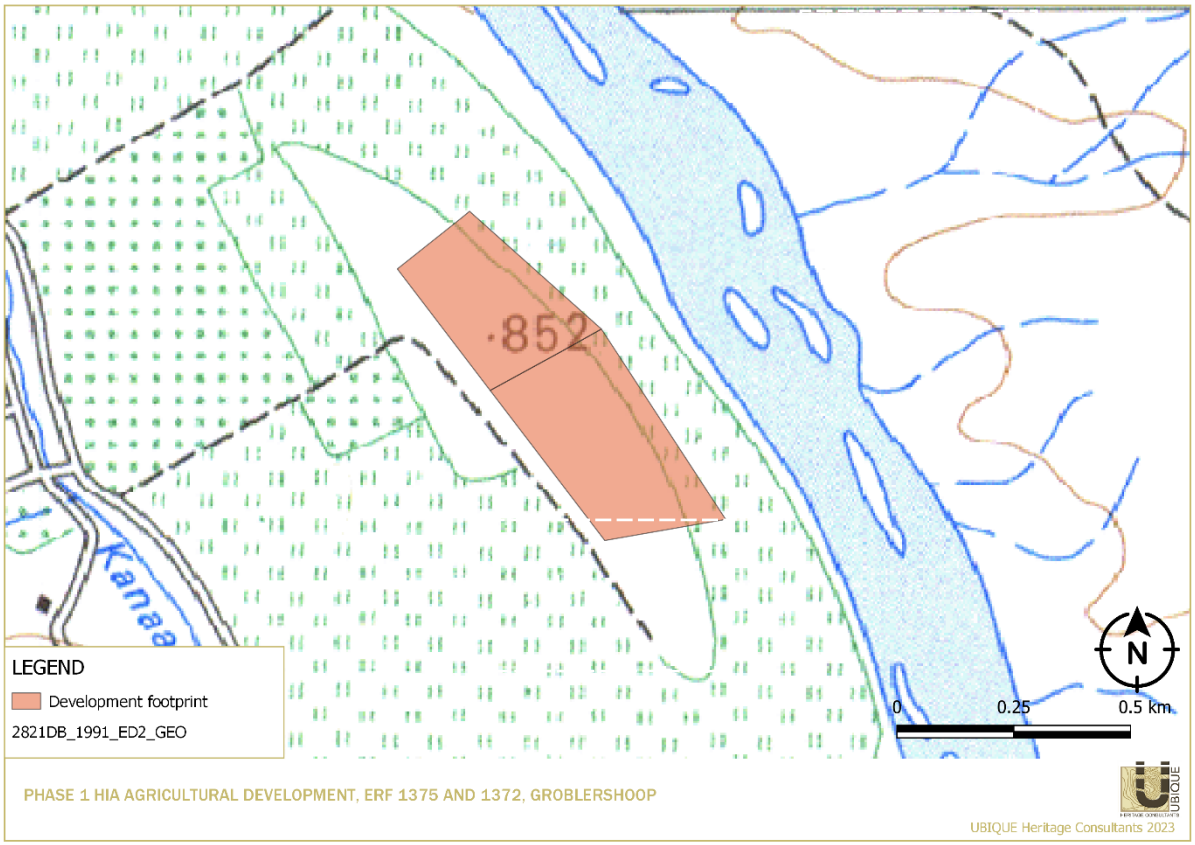


Figure 3 *Locality of the development footprint, indicated on 1: 50 000 2821DB map.*

5. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

5.1 Region: Northern Cape

South Africa has a long and varied history of human occupation (Deacon & Deacon 1999). This occupation dates to approximately 2mya (million years ago) (Mitchell 2002). Briefly, the archaeology of South Africa can be divided into three "major" periods: the Stone Age, the Iron Age and the Historical Period. In addition, various archaeological and historical sites have been identified and documented throughout South Africa, including the Northern Cape province.

5.1.1 Stone Age

The history of the Northern Cape is reflected in a rich archaeological landscape with a wealth of pre-colonial archaeological sites. Numerous sites have been identified and documented across the region. These sites have been dated to the Earlier, Middle and Later Stone Ages.
In southern Africa, the Stone Age can be divided into three periods. It is, however, critical to note that dates are relative and only provide a broad framework for interpretation. The division of the Stone Age, according to Lombard et al. (2012), is as follows:

- Earlier Stone Age (ESA): >2 000 000 - >200 000 years ago
- Middle Stone Age (MSA): <300 000 - >20 000 years ago
- Later Stone Age (LSA): <40 000 - until the historical period

In short, the Stone Age refers to humans that mainly utilised stone as their technological marker. Each sub-division is formed by industries where the assemblages share attributes or common traditions (Lombard et al. 2012). The ESA is characterised by flakes produced from pebbles, cobbles, percussive tools, and objects created later during this period, such as large hand axes, cleavers and other bifacial tools (Klein 2000). The MSA is associated with small flakes, blades and points. The aforementioned is generally suggested to have been made and utilised for hunting activities and had numerous functions (Wurz 2013).

Furthermore, the LSA is characterised by microlithic stone tools, scrapers and flakes (Binneman 1995; Lombard et al. 2012). The LSA is also associated with rock art. Numerous LSA rock art sites, mainly rock engravings and paintings, have been identified in the Northern Cape (Beaumont 2008; Kruger 2018; Morris 1988). These sites are commonly found on slopes, hilltops, rocky outcrops and occasionally in river beds (Kruger 2018). Banded ironstone occurs on several sites throughout the Northern Cape. Due to its superior flaking qualities, it would appear to have been a favoured raw material for making stone tools (Kaplan 2012b). Beaumont et al. (1995) state, regarding the LSA, that "virtually all the 'Bushmanland' sites so far located appear to be ephemeral occupation by small groups in the hinterland on both sides of the [Orange] river". This contrasts sharply with the substantial herder encampments along the Orange River floodplain (Morris 2013a, b, c, d, e, & f). It has been noted by Beaumont et al. (1995:240-241) that a widespread low density of stone

artefacts scatters from the Pleistocene age appears across areas of 'Bushmanland' to the south. Here, raw materials, mainly quartzite cobbles, were derived from the Dwyka Glacial (Morris 2013a, b, c, d, e, & f). Morris (2013b & c) states that substantial MSA sites are uncommon in Bushmanland. However, several sites have been recorded but yielded small samples.

Although the Northern Cape region seems sparsely populated by humans in the past (Kruger 2015a and b), the archaeological sites in this landscape are not scattered randomly (Kruger 2018). Previously conducted surveys have revealed signs of human occupation "mainly in the shelter of granite inselbergs (koppies) on red dunes which provided clean sand for sleeping, or around the seasonal pans" (Beaumont et al. 1995:264). Archaeological sites and MSA and LSA scatters and quarries frequently occur in low-lying areas on plains between dune straights and outcrops along the Orange River; in other words, near water. They can likewise be found close to local sources of highly-prized raw materials such as banded iron formations (BIF), jaspilite, and specularite (Morris 2012; Kruger 2015; 2018).

Beaumont et al. (1995) state that low-density lithic scatters cover thousands of square kilometres of Bushmanland. Most studies and surveys conducted throughout the Northern Cape have recorded Stone Age sites and surface scatters of Stone Age artefacts (ranging from the ESA, MSA and LSA) throughout the Northern Cape. These include the districts of Groblershoop, Griekwastad, Hotazel, Kenhardt, Pofadder, Marydale, and Upington (Dreyer 2006, 2008a, 2012; Engelbrecht & Fivaz 2019; Kaplan 2008, 2012, 2013 a & b; Kruger 2015; Morris 2012, 2013; Rossouw 2013; Van Ryneveld 2007; Van Vollenhoven 2014 and Webley 2013). Large rubbing stones, Acheulean hand axes (with secondary retouch) and scatters of core flakes have been found during previous investigations throughout the broader region (Dreyer 2008b, 2013 Revised, 2014). Van Ryneveld (2007) documented low densities of MSA artefact scatters at several Quartz outcrops on the farm Boksputs 118. An ancient specularite working site was recorded on the eastern side of Postmasburg, Doornfontein (Van Vollenhoven 2014). Associated Ceramic Later Stone Age material and older transitional ESA/MSA Fauresmith sites were documented at Lyly Feld, King, Mashwening, Demaneng, Rus & Vrede, Gloucester, Paling and Mount Huxley (Engelbrecht & Fivaz 2019). Moreover, MSA, LSA tools, and rock engraving were found at Putsonderwater, Beeshoek and Bruce (Engelbrecht & Fivaz 2019). In addition, numerous Stone Age sites have been identified, documented and excavated in the surrounding areas near Kathu, the Doornlaagte ESA site, and the Wonderwerk Caves (Van Vollenhoven 2014; Dreyer 2015). The Stone Age sites and artefacts found and documented near the Kathu Pans represent one of the most extended preserved Stone Age sequences in South Africa. They yield artefacts and sites from the ESA, MSA and LSA with evidence of 500 000-year-old hafted stone points (Engelbrecht & Fivaz 2019).

5.1.2 Iron Age

The Iron Age (IA) is characterised by the use of metal (Coertze & Coertze 1996: 346). There is some controversy about the periods within the IA. Van der Ryst & Meyer (1999) have suggested that there are two phases within the IA, namely:

- Early Iron Age (EIA) 200 – 1000 A.D
- Late Iron Age (LIA) 1000 – 1850 A.D

However, Huffman (2007) suggests instead that there are three periods within the Iron Age, these periods are:

- Early Iron Age (EIA) 250 – 900 A.D
- Middle Iron Age (MIA) 900 – 1300 A.D
- Late Iron Age (LIA) 1300 – 1840 A.D

Thomas Huffman believes that the Middle Iron Age should be included within this period; his dates have been widely accepted in the IA field of archaeology.

The South African Iron Age is generally characterised by farming communities with domesticated animals, cultivated plants, manufactured and used ceramics and beads, and smelted iron for weapons and manufactured tools (Hall 1987). Iron Age people were often mixed farmers/agropastoralists. These agropastoralists generally lived in areas with sufficient water for domestic use and arable soil that could be cultivated with an iron hoe. Most Iron Age (IA) settlements built by agropastoralists were permanent settlements (with a few exceptions). They comprised houses, raised grain bins, storage pits and animal kraals/byres, contrasting with pastoralists' and hunter-gatherers' temporary camps (Huffman 2007). It is evident in the archaeological record that IA groups had migrated with their material culture (Huffman 2002).

Most IA groups in southern Africa preferred to occupy southern African central and eastern parts from about 200 AD. The San and Khoi remained in the western and southern parts (Huffman 2007; Van Vollenhoven 2014); it is, thus, very rare, but not uncommon, to find IA sites in the Northern Cape.

Early farmers/agropastoralists expanded in this region between 400 AD and 1100 AD. These early farmers settled in semi-permanent settlements (De Jong 2010). De Jong (2010) states that the EIA continued until the 15th century in the Lowveld. However, it ended by 1100 AD on the escarpment. The Highveld became active again from the 15th century onwards because of the gradually warmer and wetter climate. This later phase (the LIA) was accompanied by extensive stone-walled settlements, such as the Thlaping capital Dithakong, approximately 40 km north of Kuruman (De Jong 2010). The Sotho-Tswana and Nguni-speaking societies are the descendants of the LIA mixed farming communities. They found that the region was already sparsely inhabited by LSA Khoisan groups (the “first people”). De Jong (2010) comments that many of them were eventually assimilated by LIA communities. Only a few had managed to survive. Some of the surviving groups included the Korana and the Griqua. However, it should be mentioned that this contact period has often been referred to as the Ceramic LSA. It is often represented by sites such as the earlier mentioned Blinkklipkop specularite mine near Postmasburg and found cultural material at the Kathu Pan (De Jong 2010).
IA sites have been recorded in the northeastern part of the province. However, according to Kruger (2018), environmental factors delegated that the spread of IA farming westwards from the 17th

century was constrained mainly to the areas east of the Langeberg Mountains. Nevertheless, there has been evidence of an IA presence as far as the Upington area in the 18th century (Kruger 2018). LIA people had briefly utilised the area close to the Orange River, as they had mined copper in the Northern Cape (Van Vollenhoven 2014).

5.1.3 Historical period

The Historical/Colonial period generally refers to the last 500 years when European settlers and colonialism entered southern Africa (Binneman et al., 2011). During the colonial frontier period, place names started becoming fixed on maps and farm names, specifically in a cadastral sense. Numerous names have Khoekhoegowab origin and, as Morris (2017a) states, encapsulate vestiges of pre-colonial/indigenous social geography.

The development of a rich colonial frontier can be seen in the archaeological record (Kruger 2018). This arid part of South Africa's interior was colonised until relatively recently (because of its distance from the Cape Colony). The Historical period of the Northern Cape coincides with the incursion of white traders, hunters, explorers, and missionaries into the interior of South Africa (Engelbrecht & Fivaz 2019). The historical period started with the first recorded oral histories (Van Vollenhoven 2014). The documented records of this region dating from the 18th- and 1- centuries mainly pertain to areas south of and along the Orange River (Morris 2018a, b & c). Hendrick Wikar and Robert Gordon, who, according to Morris (2018a, b & c) and Morris & Beaumont (1991), were two of the earliest travellers, had followed the river as far as and beyond the region during the 1770s. Wikar and Gordon provided descriptions of the terrain and the communities living along the river (Morris 2018a, b & c; Morris & Beaumont 1991). Some other early travellers, traders, and missionaries, who arrived in the region during the 19th century, include PJ Truter, William Somerville, Cowan, Donovan, Burchell and Campbell (De Jong 2010). The London Mission Society (LMS) station near Kuruman was established in 1817 by James Read (De Jong 2010; Van Vollenhoven 2014). Various buildings and structures that have been documented and recorded can be associated with early travellers, traders, and missionaries. There is also evidence of the settlements of the first white farmers and towns in the Northern Cape. These historical buildings and structures have been captured on the SAHRIS database in areas such as Kakamas, Kenhardt, Keimoes and Upington.

The surveying, division and transference of Government-owned land to farmers mark the initial distribution of land to colonial farmers from the 1880s onward (De Jong 2010). It is believed that most farms were still government farms and were leased to farmers in 1875. The farms were only later sold to individuals (Van Vollenhoven 2014). During the late 1920s, more permanent and large-scale settlements and possibly some of the first farmsteads started to appear in the region.

The region has been the backdrop to various incidents of conflict. Numerous factors such as population growth, increasing pressure on natural resources, the emergence of power blocs' attempts to control trade and the emergence of the Griquas, and penetration of the Korana and early white communities from the southwest resulted in a period of instability in South Africa. Furthermore, with the introduction of loan farms in the second half of the 18th century, an influx

of newcomers such as trekboers, European game hunters and livestock thieves contributed to the region's volatility and sociocultural stress and transformation (Mlilo 2019).

The period known as the Difaqane/Mfecane began in the late 18th century and effectively ended with the settlement of white farmers in the interior (De Jong 2010; Mlilo 2019). The Difaqane/Mfecane period also affected the Northern Cape Province around the 1820s, relatively later than the rest of southern Africa (De Jong 2010). This period was prompted by the incursion of displaced refugees associated with the Fokeng, Tlokwa, Hlakwana and Phuting groups (De Jong 2010).

Moreover, during the 1830s, the Voortrekkers started migrating northwards from the Cape Colony. This migration was due to their dissatisfaction with British rule (Eldredge 1987). The Voortrekkers' migration is known as the "Groot Trek" (Great Trek). The Voortrekkers had conflict with Tswana and missionary groups who had settled near Bechuanaland and Griqualand West (Van Vollenhoven 2014). War and battles between the Voortrekkers, Zulu, and Sotho-Tswana communities eventually arose due to the migrations (De Bruyn 2019).

Between 1879-1880 the region was also caught up in the Koranna War. Further military activity in the area included the rise of the 'rebels' during the Anglo-Boer War and again in 1915 with the incursion of German troops (Morris 2018a, b & c). Numerous graves can be linked to the battles fought during the 1914 Rebellion (Engelbrecht & Fivaz 2019). It is believed that any military settlement related to the Koranna Wars would have been closer to the Orange River (Webley & Halkett 2014).

It is known that San hunter-gatherers utilised the landscape for thousands of years, and Khoi herders moved into South Africa with their cattle and sheep approximately 2000 years ago. With the arrival of the Dutch settlers in the Cape in the mid-17th century, clashes between the Europeans and Khoi tribes in the Cape Peninsula resulted in the Goringhaiqua and Goraxouqua migrating north towards the Gariep/Orange River in 1680. These tribes became known as the Korannas, living as small tribal entities in separate areas (Penn 2005).

Bushmanland was one of the last regions of the Cape Province to be settled by early European farmers. This was because the region was very arid and situated quite far from Cape Town and the produce markets. Many of the farms in the Bushmanland area were only allocated after the introduction of the windpump to South Africa in the 1870s. In other words, the windpump made the arid lands accessible and suitable for grazing (Webley & Halkett 2012). Historical literature also confirms that San hunter-gatherers occupied Bushmanland early in the 19th century. During the 19th century, Basters of mixed descent lived around the salt pans in Bushmanland. They were, however, driven away from the land as the farms were surveyed and made available to European farmers (Webley & Halkett 2012). In the late 18th and early 19th centuries, with the introduction and implementation of the commando system, the Karoo 'Bushmen' were eventually destroyed or indentured into farm labour (ACRM 2015).

Several finds have been recorded at sites in the Northern Cape region. These include but are not limited to 20th-century glass bottles and a rusted enamel basin (Orton 2015a); some colonial-era stonewalling (Morris 2013b); glass and porcelain fragments (Beaumont 2007; Morris 2013a & b); colonial farmsteads (Morris 2013; Van Ryneveld 2017a and b); heavily soldered Anglo-Boer War (1899-1902) food containers (Dreyer 2006; Beaumont 2007) and fired rifle cartridge shells (Dreyer 2014a; Beaumont 2007); and numerous man-moved and stacked boulders (possibly representative of Boer positions during the Siege of Kimberly (Beaumont 2007).

Apart from a few exceptions, archaeology along the Orange River has mainly focused on the Middle Orange River and the Richtersveld (Orton & Webley 2012). The Middle Orange River was densely inhabited pre- and proto-colonial times (Mlilo 2019). The area is made up of several islands. Herders often chose to live on these islands for their natural protection from stock thieves and wild animals. Small-stock farmers mainly occupied the vicinity along the Orange River. It was during the 1930s that the first great influx of people started. These people had developed an extensive network of irrigation channels that supplied water for the development of vineyards and other cash crops (e.g. grain crops), cultivated in a narrow band along the Orange River leading to the region known as the Green Kalahari. Van Schalkwyk (2019) comments that this had resulted in numerous smaller hamlets and villages. These hamlets/villages had churches, cemeteries and shops.

According to Ross (1975), the first descriptions of the population of the Middle Orange River can be credited to the Swedish traveller Hendrick Wikar. Wikar started his long journey from Cape Town and eventually reached the middle and lower reaches of the Orange River. Wikar is believed to have been a deserter from the service of the Dutch East India Company. Thus, Wikar remained within the area for several years and compiled a report of his experiences in exchange for a pardon (Ross 1975). He recorded his encounters with the Khoisan groups who called themselves Einiqua or River People. The Einiqua were divided into three “kraals”, namely the Namnykoa near the Augrabies Falls, the Aukokoa of Kanoneiland and the Kaukoa on islands west of Keimoes and other islands to the east (Engelbrecht & Fivaz 2020). Their kraals consisted of numerous sheep and cattle. The Einiqua had also hunted game, gathered plants, and cultivated dagga, but according to Wikar, no other crops (Ross 1975). The Anoe eis people, whom Wikar characterised as “Bushmen”, were among the pastoralist groups living on the islands. As they had no domestic stock, these people subsisted on fishing, game-trapping, hunting, and gathering plant foods (Morris & Beaumont 1991). However, Colonel Robert Jacob Gordon, who visited the region in 1779, remarked that they were Einiqua who had lost their cattle because of an argument with the Namneiqua village (Morris & Beaumont 1991). The region's San and Khoekhoe hunter-gatherers had reached stability by the early 18th century (Mlilo 2019). However, the area west of the Langeberg and east of Upington was occupied by IA groups such as the BaTlaping. Their influence had reached as far down the river as Upington (Morris 1992).

De Jong (2010) classifies the cultural landscape along the Gariep/Orange River as predominantly historic farmland. From the 1880s onwards, irrigation of the Orange River played a central role in the economy of the area in the vicinity of Upington (Legassick 1996). Hunter-gatherers shared the river’s resources (Morris 1992). The beginning of irrigation in this area has been attributed to the Basters. By the 18th century, the Basters had focused on the Orange River (and Namaqualand) as

a sanctuary from colonial rule (Mlilo 2019; Van der Walt 2015). They were regarded as "primitive pastoral people" who had "crude" ways to divert the river to their "little gardens" (Van der Walt 2015). The term "Basters" characterises a group of people of mixed percentage (white and Khoekhoe or slave and Khoekhoe). According to Van der Walt (2015), the term also implies an economic category that implies possessing property and being culturally European.

The construction and development of canal systems were vital for the irrigation of extensive vineyards and orchards and the expansion of major agricultural enterprises in the region (Engelbrecht & Fivaz 2018). The credit for formalising and extending the irrigation system belongs to Reverend C.H.W. Schröder, a Dutch Reformed Church (DRC) missionary and Special Magistrate for the Northern Border John H. Scott. By the time Schröder came to Upington in July 1883, there were people already living in the area of Keimoes who had planted fields and utilised irrigation. The irrigation scheme of the Basters can be attributed to Abraham September's innovation. Abraham September was born in slavery and became part of the Baster people of South Africa. It is interesting that Schröder and Scott had begun the canal from where Abraham September had selected. Legassick (1996) commented that "the small, white-painted, stone house where Abraham September lived when he undertook this work survives to this day, though the house and the land upon which it stands have long passed from the hands of the September family".

In 1882, the first 81 farms to be given out to the north of the Orange River from Kheis (opposite the present Groblershoop) to the Augrabies Falls were allocated almost exclusively to Basters (Morris 1992). The further division of these farms commenced when the irrigation canal was completed. These farms were divided into "water-erven" for irrigation and "dry-erven" for establishing buildings (Van der Walt 2015). More white settlers moved to the Gordonia region in the late 19th century. By the turn of the century, approximately 13 Afrikaner families had settled at Keimoes (De Beer 1992; Van der Walt 2015). Many farmers moved to new areas due to the aftermath of the scorched earth policy of the Anglo-Boer War. These farmers searched for greener pastures. Settlements next to the Gariep/Orange River provided adequate irrigation for crops (Engelbrecht & Fivaz 2020).

Portuguese sailors referred to the Gariep/Orange River as the St Anthonio, and on the maps from 1685, Simon van der Stel marked it as the Vigiti Magna. In 1760, Jacobus Coetzee, the elephant hunter, named the river: "de Groote Rivier" (the Great River). In 1761, land surveyor Carel Brink noted that the river is known to the local island inhabitants as the Tyen Gariep (Our River). The London Missionary Society's (LMS) John Campbell spoke of the Gariep, Gareeb, and Garib as the name the Korannas used. The river's contemporary name (Orange River) can be accredited to Robert Gordon. Gordon took his rowboat out to the middle of the river on the evening of the 17th of August, 1779. He raised and toasted the Netherland's flag and proclaimed the river in the name of Prince van Oranje. From this day forward, the river was known (and indicated on maps) as the Orange River. However, the river is often referred to as the Gariep or Grootrivier (Fivaz & Engelbrecht 2020).

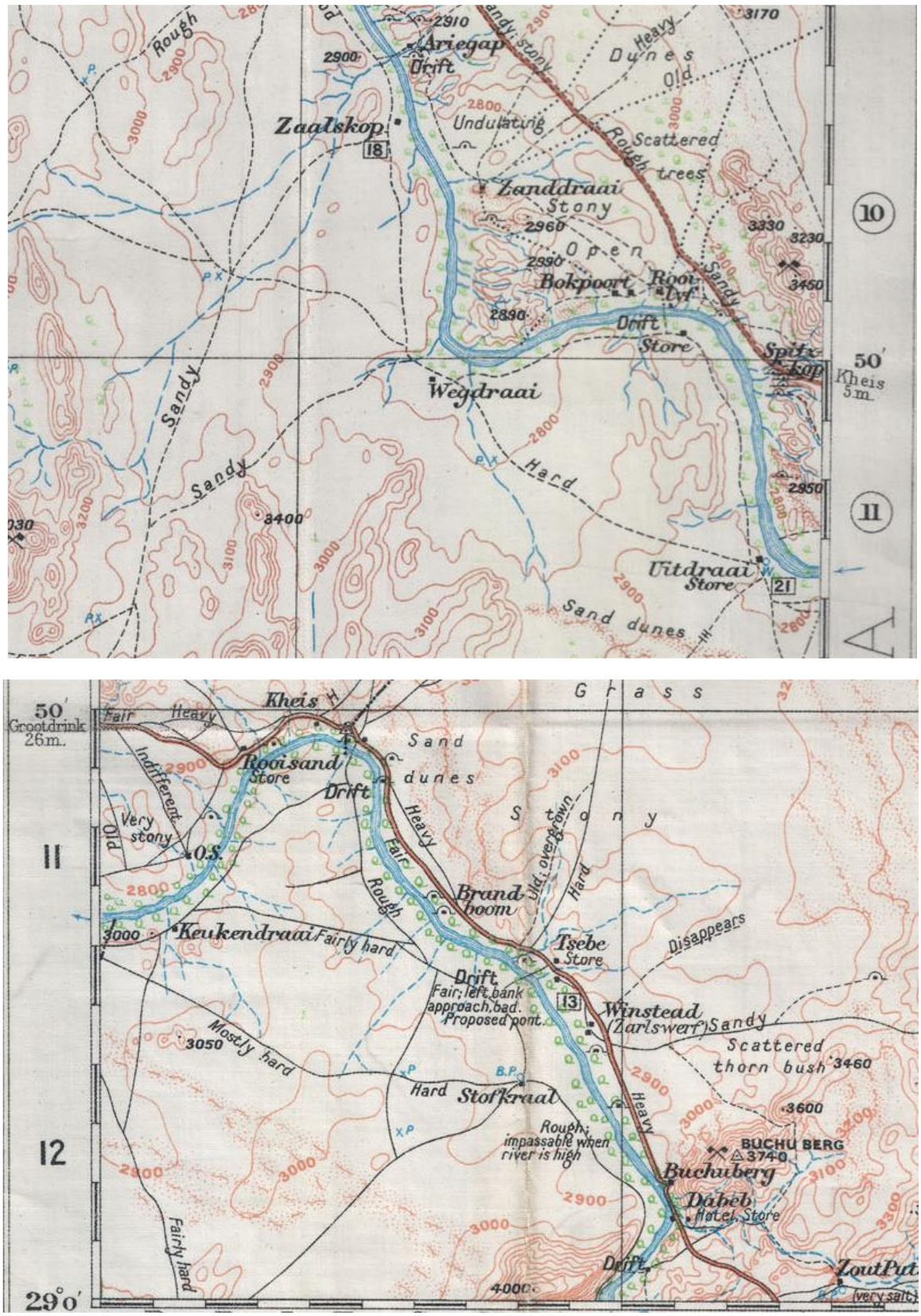


Figure 4 *Imperial Map of !Kheis and surrounds. Image from UCT digital collections, https://digitalcollections.lib.uct.ac.za/*

5.2 Local: Groblershoop

It was around 1870 that the first Colonial farmers settled in the Groblershoop area (Orton & Webley 2013). The town of Groblershoop was originally developed on the farm Uitdraai (Engelbrecht & Fivaz 2019). Military topographic maps from 1908 and 1913 show a sparsely populated area with numerous tracks across the sandy plains. There were halts situated at Zaalskop, Wegdraai, Uitdraai, Winstead and a hotel at Dabep. Access to water at Wegdraai was via a steep and narrow approach. At Uitdraai, a large well and tank were situated underneath the house and a store where a supply of forage could be obtained. A weir was constructed across the Orange River at Buchuberg, with a turbine historic water turbine driven by solid-oak gears in the Orange River on the Farm Winstead. This historic water turbine was built in 1913 (Engelbrecht & Fivaz 2019). All along the eastern shore of the Orange River, locations of “native huts and kraals” are indicated.

Groblershoop developed due to the development of the Boegoeberg Dam and water channels in 1929 (Van Schalkwyk 2019; 2020). The town was initially known as Sternham, with the first house dating to 1912. In 1935, the town was renamed Groblershoop, after a former Minister of Agriculture: Mr PGW Grobler. Mr Grobler assisted in developing the Boegoeberg Dam and the irrigation project in 1929. He played a substantial role in this development, creating employment for the poor-white community and boosting progress in the region (Engelbrecht & Fivaz 2019). The idea for constructing the weir and irrigation canal was first considered in 1872. However, proposals for the project were rejected in 1896 and again in 1907 for being too expensive (Orton & Webley 2013). Finally, after about 20 years of preparatory work, the construction of the Boegoeberg Dam began in May 1929. The dam was completed in 1932, and the canal in 1934. Even children as young as nine years old were employed to work on the construction of the dam and irrigation canals. It is believed that about 50 people (39 children) died during the project's construction (Orton & Webley 2013). The Boegoeberg Dam is a significant heritage structure (Orton & Webley 2013).

6. HERITAGE SENSITIVITY

The Heritage Screening tool (https://screening.environment.gov.za/) shows low significance with locations of medium/high sensitivity to the north, northwest, south, southeast and southwest and east of the proposed project area.

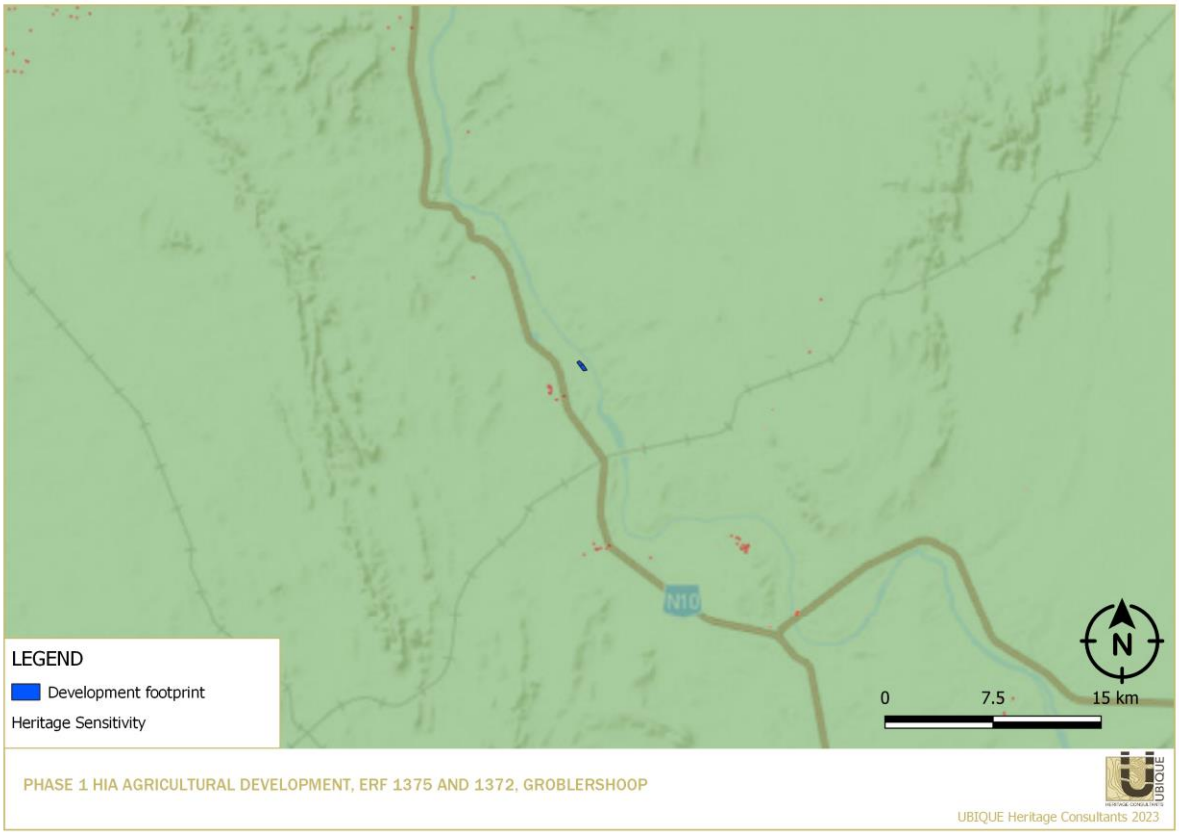


Figure 5 *The Project area indicated on the Heritage Screening tool (https://screening.environment.gov.za/)*

6.1 Summary of Local Heritage Resources: Spes Bona 2355 and surrounds

The desktop study revealed that Impact Assessments had been done in and around the Groblershoop area. Some of the assessments reported on cultural material and features relating to the Stone Age and the Historical/Colonial era (e.g. Beaumont 2008; Dreyer 2006, 2012, 2014, 2015; Engelbrecht & Fivaz 2019; Fivaz & Engelbrecht 2020; Morris 2012, 2014; Orton & Webley 2013; Van der Walt 2012; Van Ryneveld 2007; Van Schalkwyk 2020; Webley 2013).

6.1.1 Stone Age

Numerous reports in and around the current study area have reported on lithics, dating from the ESA, MSA and LSA.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Fivaz & Engelbrecht 2020	GBH001	28° 54' 52.2" S 21° 59' 56.5" E 24.4km SE	ESA/MSA chunks and scraper.
Fivaz & Engelbrecht 2020	GBH002	28° 54' 44.4" S 21° 59' 46.3" E 23.6km SE	ESA/MSA core, chunks and flake.
Fivaz & Engelbrecht 2020	GBH003	28° 54' 46.4" S 21° 59' 48.9" E 23.9km SE	ESA/MSA flakes, chunks and scraper.
Fivaz & Engelbrecht 2020	GBH004	28° 54' 37.6" S 21° 59' 46.6" E 23.5km SE	ESA/MSA flakes, scraper and chunks.
Fivaz & Engelbrecht 2020	GBH005	28° 54' 33.3" S 21° 59' 45.8" E 23.3km SE	MSA/LSA flakes, chunks and core.
Fivaz & Engelbrecht 2020	GBH006	28° 54' 48.9" S 21° 59' 53.8" E 23.9km SE	ESA/MSA flakes, scraper and chunks.
Fivaz & Engelbrecht 2020	GBH007	28° 54' 39.2" S 21° 59' 37.0" E 23.5km SE	ESA/MSA chunks and flakes.
Fivaz & Engelbrecht 2020	GBH008	28° 54' 25.6" S 21° 59' 46.7" E 22.9km SE	ESA/MSA Flakes, unfinished handaxe, chunks and blade.
Fivaz & Engelbrecht 2020	GBH009	28° 54' 20.5" S 21° 59' 49.7" E 22.8km SE	ESA/MSA Scraper, flakes and chunks.
Fivaz & Engelbrecht 2020	GBH010	28° 54' 22.1" S 21° 59' 47.6" E 22.8km SE	ESA/MSA flakes and chunk.
Engelbrecht & Fivaz 2019	1	28° 50' 47.2" S 22° 00' 09.6" E 18.6km SE	MSA/LSA Two isolated LSA/MSA stone cores. Retouched. No context.
Engelbrecht & Fivaz 2019	2	28° 51' 07.2" S 22° 00' 18.4" E 19.2km SE	MSA/LSA open scatter.
Engelbrecht & Fivaz 2019	3	28° 51' 08.5" S 22° 00' 19.1" E 19.2km SE	LSA/MSA isolated stone core. No context.
Engelbrecht & Fivaz 2019	4	28° 52' 08.4" S 21° 59' 13.8" E 19.1km SSE	High-density LSA open lithic scatter with local ceramics. Surface scatter of flakes, scrapers, cores, and microliths. Probable hunter/herder site.
Engelbrecht & Fivaz 2019	5	28° 52' 08.5" S	

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		21° 59' 13.7" E 19.1km SE	High-density LSA/MSA open lithic scatter without local ceramics. Surface scatter of flakes, scrapers, cores, and microliths.
Engelbrecht & Fivaz 2019	6	28° 52' 08.0" S 21° 59' 23.5" E 19.3km SE	LSA/MSA open scatter of flakes, scrapers, cores and microliths. Moderate density, frequency.
Engelbrecht & Fivaz 2019	7	28° 52' 08.4" S 21° 59' 23.9" E 19.3km SE	LSA upper grindstone. No context.
Engelbrecht & Fivaz 2019	8	28° 52' 08.6" S 21° 59' 24.0" E 19.2km SE	LSA/MSA open scatter of flakes and scrapers.
Engelbrecht & Fivaz 2019	9	28° 52' 12.9" S 21° 59' 15.0" E 19.2km SSE	High-density LSA/MSA open lithic scatter. Surface scatter of flakes, scrapers, cores, and microliths.
Engelbrecht & Fivaz 2019	10	28° 52' 13.4" S 21° 59' 15.9" E 19.2km SE	High-density LSA open lithic scatters with local ceramics. Surface scatter of flakes, scrapers, cores, and microliths. Probable hunter/herder site.
Engelbrecht & Fivaz 2019	11	28° 52' 06.0" S 21° 59' 34.5" E 19.4km SE	High-density LSA open lithic scatter without local ceramics. Surface scatter of microliths.
Engelbrecht & Fivaz 2019	12	28° 52' 16.4" S 21° 59' 16.1" E 19.3km SSE	LSA/MSA open scatter of flakes and scrapers.
Engelbrecht & Fivaz 2019	13	28° 52' 10.7" S 21° 59' 27.0" E 19.3km SE	High-density LSA/MSA open lithic scatter. Surface scatter of flakes, scrapers, cores, and microliths. Probable knapping site.
Engelbrecht & Fivaz 2019	14	28° 52' 16.5" S 21° 59' 16.6" E 19.3km SSE	High-density LSA/MSA open lithic scatter. Surface scatter of flakes, scrapers, cores, and microliths. Probable knapping site.
Engelbrecht & Fivaz 2019	15	28° 52' 08.7" S 21° 59' 35.6" E 19.5km SE	LSA/MSA upper grindstone.
Engelbrecht & Fivaz 2019	16	28° 52' 08.1" S 21° 59' 38.8" E 19.5km SE	High-density LSA/MSA open lithic scatter. Surface scatter of flakes, scrapers, cores, and microliths. Probable knapping site.
Engelbrecht & Fivaz 2019	17	28° 52' 11.0" S 21° 59' 43.7" E 19.6km SE	LSA/MSA isolated scraper. No context.
Engelbrecht & Fivaz 2019	18	28° 52' 25.6" S 21° 59' 21.7" E 19.6km SSE	LSA/MSA open scatter of flakes and scrapers.
Engelbrecht & Fivaz 2019	19	28° 52' 12.3" S 21° 59' 48.4" E 19.8km SE	High-density LSA/MSA open lithic scatter. Surface scatter of flakes, scrapers, cores, and microliths. Probable knapping site.
Engelbrecht & Fivaz 2019	20	28° 52' 27.7" S 21° 59' 22.1" E	

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES / PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		19.7km SE	High-density LSA/MSA open lithic scatter. Surface scatter of flakes, scrapers, cores, and microliths. Probable knapping site.
Engelbrecht & Fivaz 2019	21	28° 52' 30.3" S 21° 59' 19.9" E 19.7km SE	Extremely disturbed ground and with possible Stone Age sites destroyed.
Engelbrecht & Fivaz 2019	22	28° 52' 19.1" S 21° 59' 42.6" E 20.2km SE	LSA/MSA open scatter of flakes and scrapers. Dune site.
Orton & Webley 2013	ZKB2013/001	S29 02 22.5 E22 12 15.9; S29 02 23.4 E22 12 14.4; S29 02 23.4 E22 12 11.8 42.2km SE	Two grindstones and a wide spread of banded ironstone artefacts, probably MSA. A few with retouch. Very dense distribution of artefacts, all banded ironstone. More of the same MSA on banded ironstone, all along the escarpment overlooking the river. MSA flake/blade with facetted platform.
Orton & Webley 2013	018 (n/a)	S29 02 15.7 E22 12 06.1 47km SE	Very light background scatter of banded ironstone artefacts on the slopes of the hill.
Orton & Webley 2013	ZKB2013/005	S29 03 59.0 E22 12 52.4 49.9km SE	Possibly background scatter but fairly high density and located on a little koppie.
Orton & Webley 2013	076 (N/A)	S29 04 24.9 E22 12 12.9 49.9km SE	Background scatter of banded ironstone and some quartzite including a radial core. MSA.
Morris 2012	B	28.78203 ° S 21.91159 ° E 7.4km SE	Widely dispersed artefacts on jaspilite
Morris 2012	C and D	28.74627 ° S 21.97560 ° E; 28.74742 ° S 21.97112 ° E. 11.3km ESE	Isolates quartzite flakes, probably MSA; and an isolated quartz flake, probably LSA,
Van der Walt 2012	Find Spot 1	S28 58 03.4 E22 10 55.4 40.5km SE	MSA flake from quartzite
Van der Walt 2012	Find Spot 2	S28 58 02.6 E22 10 51.8 40.4km SE	MSA blade from banded iron stone.
Van der Walt 2012	Find Spot 3	S28 58 02.8 E22 10 45.6 40.2km SE	MSA flake from quartzite.
Van der Walt 2012	Find Spot 4	S28 58 07.6 E22 10 47.0 40.2km SE	MSA flakes from chalcedony.
Webley 2013	2642/2013/01	S28 52.979 E21 58.326 19.3km SE	MSA/LSA: a single large quartzite core and a broken thumbnail scraper made on banded ironstone (silcrete?).
Webley 2013	2642/2013/02	S28 52.975	

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		E21 58.348 19.3km SE	MSA: a small bifacially worked ironstone artefact. Scatter of quartzite discoid cores and flakes on ironstone.
Webley 2013	2642/2013/03	S28 52.994 E21 58.384 19.5km SSE	MSA spread of at least 4 cores and flakes made on banded ironstone.
Webley 2013	RSD/2013/01	S28 52.539 E21 59.372 19.8km SE	On east banks of River. Flaked hornfels cobble and some flakes cores on banded ironstone. Possibly a mixed LSA/MSA site.
Webley 2013	RSD/2013/02	S28 52.484 E21 59.387 19.7km SE	LSA: a quartz flake and a flaked hornfels cobble on the loose sands of the Orange River.
Webley 2013	RSD/2013/03	S28 52.453 E21 59.418 19.7km SE	MSA: a dense concentration of quartz, hornfels and banded ironstone artefacts on a small quartz koppie.
Webley 2013	RLF/2013/01	S28 46.484 E21 58.158 11.6km SE	A single banded ironstone flake in the red sand dunes on the edge of the ridge.
Webley 2013	2642/2013/04	S28 50.269 E21 56.417 13.5km SE	MSA: Quartzite and banded ironstone flakes and cores on a small koppie to the west of the river.
Webley 2013	2642/2013/05	S28 52.625 E21 57.535 18.2km SSE	MSA: Banded ironstone flakes and cores, a number of short, grey quartzite flakes and a single quartz blade core overlooking a drainage channel.
Van Ryneveld 2007	BKS2	S29.01672° E21.65360° 37.3km SW	MSA low density scatter
Beaumont 2008	Farm 292	28° 52' 22.0" S, 22° 01' 57.5" E 22.5km SE	Low density of lithics clearly reflecting the occasional use of this high - grade raw material source.
Dreyer 2006	Site 3	Approx. 28°48'38" S 022°09'25"E 30.3km SE	A collection of stone flakes. A single potsherd was also found.
Dreyer 2006	Site 2	Approx. 28°44'23" S 021°59'48"E 13.6km E	A collection of stone flakes. Some of the flakes showed convergent flaking characteristic of the MSA industry. Some lydianite cores were also found.
Van Schalkwyk 2020		In the general area of: -28.73309 22.00469; -28.67546 22.02122 14.5km E	Stone tools and flakes
Dreyer 2012		General area: 28°44'24" S 021°59'44"E 13.6km E	Collection of stone flakes and cores.
Dreyer 2015	Point E	28°44'16" S 022°00'03" E 14.1km E	A single scatter of worked chalcedony, banded ironstone, quartz and meta-quartzite artefacts.
Dreyer 2014b	S1, S2, S3 and S4	28°46'50" S 021°53'20" E; 28°46'59" S 021°53'34" E; 28°46'54" S 021°53'51" E;	Flakes cores and core flakes.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		28°46'43" S 021°54'12" E 6.2km SE	
Morris 2014	333	Approx. 28°48'23.41"S 21°53'11.98"E 7.8km SE	Artefacts on jaspilite immediately upslope from the riverbank and within a zone of agricultural disturbance.
Morris 2014	335	Approx. 28°47'39.65"S 21°54'5.79"E 7.4lm SE	Isolated artefacts from an area of greater than 10 x 10 m.
Morris 2014	340	Approx. 28°47'8.64"S 21°54'32.56"E 7.2km SE	Lithic artefacts.
Orton & Webley 2013	ZKB2013/06	S29 02 16.7 E22 12 05.6 47km SE	Scatter of rocks (possible hut base). One banded ironstone flake and one OES fragment here and a quartz flake a few metres away.
Orton & Webley 2013	BDW2013/001	S29 04 26.8 E22 12 04.5 49.9km SE	Stone-packed L-shaped wall on top of a bedrock ridge.
Orton & Webley 2013	BDW2013/001	S29 04 26.3 E22 12 04.4 49.9km SE	Short straight section of stone walling.
Orton & Webley 2013	BDW2013/001	S29 04 26.0 E22 12 04.3 49.9km SE	Semi-circle of walling in open area.
Orton & Webley 2013	BDW2013/001	S29 04 25.4 E22 12 04.8 49.9km SE	Section of walling.
Orton & Webley 2013	BDW2013/001	S29 04 23.1 E22 12 05.9 49.8km SE	Semi-circle of walling.
Orton & Webley 2013	BDW2013/001	S29 04 23.2 E22 12 06.1 49.8km SE	Semi-circle of walling.
Orton & Webley 2013	BDW2013/001	S29 04 23.2 E22 12 06.5 49.8km SE	Semi-circle of walling but with one end extended.
		S29 04 23.0	

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Orton & Webley 2013	BDW2013/001	E22 12 06.8 49.8km SE	L-shaped stone wall.
Orton & Webley 2013	BDW2013/001	S29 04 23.7 E22 12 06.3 49.9km SE	Stone mound.
Orton & Webley 2013	BDW2013/001	S29 04 23.9 E22 12 06.4 49.8km SE	Stone mound.
Orton & Webley 2013	BDW2013/001	S29 04 27.1 E22 12 05.3 49.9km SE	L-shaped stone wall but with top end slightly extended out. c. 10 m long.
Orton & Webley 2013	BDW2013/001	S29 04 26.8 E22 12 06.8 49.8 km SE	Semi-circle of roughly packed unformed stones, against the side of a rocky koppie, making use of the natural rock which projects out. A single banded ironstone flake in the middle.

6.1.2 Rock Art

Several rock art sites have been documented on the SAHRA Database in the wider Northern Cape region. However, no sites have been recorded in and around Groblershoop.

6.1.3 Iron Age

No Iron Age Sites were reported on in the consulted HIA/AIAs.

6.1.4 Historical/Colonial Period

Very few impact assessments were reported on cultural material and sites associated with the Historical/Colonial Period.

HISTORICAL PERIOD RESOURCES RECORDED IN 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Engelbrecht & Fivaz 2019	23	28° 52' 25.4" S 21° 59' 21.1" E 19.7km SSE	1975-1980: Location of previous settlements and cement foundations of labourer structures from 1975 to 1980s who assisted with the building of the new Orange River Bridge. Between old foundations and general area, there are surface scatters of lithics and several upper and lower grinders. The area is very disturbed.
Engelbrecht & Fivaz 2019	24	28° 52' 31.8" S 21° 59' 29.3" E 20.1km SSE	1975-1980: Part of the previous 1975-80s site with cement foundations. Only the foundations are left, no houses or settlements such as rondavels, etc. Highly disturbed.
Orton & Webley 2013	BDW2013/002	S29 04 23.0 E22 12 13.0 49.9km SE	Multitude of small piles of rocks. Possibly collected up for later collection for lining fences?
Morris 2012	A	28.78568° S 21.89133° E. 6km SSE	Stone structure
Webley 2013	RLF/2013/02	S28 45.885 E21 58.494 11.9km ESE	A stone reservoir (25m x 25m) lined with plaster and with a stone gutter running around the margins to collect water. Various rusted farm implements nearby. At least 200 m west of the line.
Dreyer 2014b	S9	28°41'57" S 021°58'37" E 12.7km ENE	Farmyard consists of a residential house and a well-built kraal with a solar installation and water supply equipment, Date of the buildings could not be ascertained.

The Groblershoop area has numerous heritage sites, ranging from buildings, stonewalling, living and heritage sites and archaeological sites, all of which are listed in this table below, which can also be found on the SAHRA Database:

HERITAGE SITES IN AND AROUND GROBLERSHOOP DOCUMENTED ON THE SAHRA DATABASE:				
Site/Object Name	Coordinates	Site type	Site Reference	Site ID
Groblershoop 008	-28.764750, 21.974900	Archaeological	GROB008	54531
Boegoeberg Hydropower Station 004	-29.038139, 22.201500	Stone walling	BOEG0004	85345
Boegoeberg Hydropower Station 008	-29.066389, 22.214556	Archaeological	BOEG0008	85349
Boegoeberg Hydropower Station 011	-29.279694, 22.182278	Structures	BOEG0011	85352
Boegoeberg Hydropower Station 012	-29.195222, 22.195278	Building	BOEG0012	85353
Boegoeberg Hydropower Station 016	-29.074111, 22.201250	Stone walling	BOEG0016	85357
Hydropower Station 017	-29.073972, 22.201222	Stone walling	BOEG0017	85358

HERITAGE SITES IN AND AROUND GROBLERSHOOP DOCUMENTED ON THE SAHRA DATABASE:				
Site/Object Name	Coordinates	Site type	Site Reference	Site ID
Hydropower Station 018	-29.073889, 22.201194	Stone walling	BOEG0018	85359
Hydropower Station 019	-29.073722, 22.201333	Stone walling	BOEG0019	85360
Hydropower Station 020	-29.073083, 22.201639	Stone walling	BOEG0020	85361
Hydropower Station 021	-29.073111, 22.201694	Stone walling	BOEG0021	85362
Hydropower Station 022	-29.073111, 22.201806	Stone walling	BOEG0022	85363
Hydropower Station 023	-29.073056, 22.201889	Stone walling	BOEG0023	85364
Hydropower Station 024	-29.073250, 22.201750	Stone walling	BOEG0024	85365
Hydropower Station 025	-29.073306, 22.201778	Stone walling	BOEG0025	85366
Hydropower Station 026	-29.074194, 22.201472	Stone walling	BOEG0026	85367
Hydropower Station 027	-29.074111, 22.201889	Stone walling	BOEG0027	85368
Hydropower Station 028	-29.073056, 22.203611	Stone walling	BOEG0028	85369
Karoshoek 002	-28.439990, 21.557570	Living Heritage/Sacred sites	KAR0002	45991
Remaining Extent of the Farm Bokpoort 390	-32.654407, 25.416870	Archaeological	Bokpoort II	35820

6.1.5 Graves/Burials

Several graves were recorded in the area around the development footprint.

GRAVES/BURIALS RECORDED IN 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Fivaz & Engelbrecht 2020	GBH011	28° 54' 29.56" S 21° 59' 41.24" E 23km SSE	1950s-1970s four marble headstones, other predominantly fieldstone headstones and cairns
Engelbrecht & Fivaz 2019	25	28° 52' 24.6" S 21° 59' 25.9" E 19.7km SSE	Unmarked grave (Freeman graves)
Engelbrecht & Fivaz 2019	26	28° 52' 24.7" S 21° 59' 25.9" E 19.7km SSE	Unmarked grave (Freeman graves)
Engelbrecht & Fivaz 2019	27	28° 52' 24.8" S 21° 59' 25.9" E	Unmarked grave (Freeman graves)
Engelbrecht & Fivaz 2019	28	28° 52' 07.7" S 21° 59' 14.3" E 19.7km SSE	Possible grave. Not confirmed and unmarked
	29	28° 52' 07.9" S	

GRAVES/BURIALS RECORDED IN 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Engelbrecht & Fivaz 2019		21° 59' 14.2" E 19.1km SSE	Possible grave. Not confirmed and unmarked
Orton & Webley 2013	ZKB2013/002	S29 02 17.3 E22 12 05.4 47km SE	A stone cairn, about 1.5m in diameter, roughly round, no headstone.
Orton & Webley 2013	ZKB2013/003	S29 02 18.8 E22 12 06.5 47.2km SE	A headstone in the loose river sand which reads: “Rus in vrede Gert Peters oorlede die 10 April 1953, 62 jaar, die seun van die mens …”. According to Mr Fourie, this was someone who had died/drowned upriver and whose body had washed down river. He was buried where found on the river banks.
Orton & Webley 2013	ZKB2013/004	S29 03 23.0 E22 12 55.1 49.5km SE	At least 8 graves right next to the road, on the way to Susara Geldenhuys home. They are clearly graves, arranged in a row, the closest about 1m from the road. Susara says that as long as she can remember, they have been there. Her grandfather bought the farm, and her father and mother have been there at least 50 years.

7. IDENTIFIED RESOURCES AND HERITAGE ASSESSMENT

7.1 Surveyed area

The area surveyed for the impact assessment was dictated by the Google Earth map of the development footprints provided by the client. The proposed development area was surveyed by vehicle and on foot. The pedestrian survey was conducted in predominantly 30-50 m transects.

Figure 6 *Survey tracks across the development footprint.*

7.2 Description of the affected environment

The development area falls within the Lower Gariep Alluvial Vegetation. The surrounding areas include Bushmanland Arid Grassland vegetation type, Lower Gariep Broken Veld and Gordonia Duneveld. The Lower Gariep Alluvial Vegetation is predominantly characterised by flat alluvial terraces and riverine islands that support a complex of riparian thickets, reed beds, as well as flooded grasslands and herb-lands populating sand banks and terraces within and along the river (Mucina & Rutherford 2006). Moreover, according to Mucina and Rutherford (2006), the soil and

geology of this vegetation type are recent alluvial sediments from the Orange River, giving rise to soil forms such as Dundee and Oakleaf.

The environment observed combines klipveld and sand veld environments with flat plains and rocky outcrops in certain areas. The site has a slight slope towards the ENE (East-Northeast). The terrain is relatively flat and rocky, with sandy patches and a slight slope towards the ENE. Certain areas were previously disturbed by agricultural and road construction. A few two-track gravel roads cross the site. Rocky outcrops are present throughout the site, but outcrops are not very large. Small pebbles, dolerite and BIF gravel are dominant throughout the site. The primary geology observed on the ground surface throughout the survey included Calcrete/Limestone, Banded Ironstone Formation (BIF), a few Dolorite outcrops, Quartz, Jaspis (minimal), Schale, and CCS.

The dominant vegetation noted includes Black Thorn Acacia/Swarthaak (*Acacia mellifera*), Camelthorn Tree/Kameeldoringboom (*Acacia erioloba* and *Acacia haematoxilon*), Campher Bush (*Tarchonanthus camphorates*), Tumbleweed/Gifbol (*Ammocharis coranica*), Feathertop chloris/Vingergras (*Chloris virgata*), Tall Bushmangrass/Lanbeen Boesmangras (*Stipagrostis ciliate*), Silky Bushmangrass/Blinkblaar Boesmangras (*Stipagrostis uniplumis*), Krulblaargras (*Eragrostis biflora*), Three-Thorn tree (*Rhigozum trichotomum*), Aloe (*Aloe argenticauda*), Prosopis tree (*Prosopis glandulosa*), and Kraalbos (*Galenia africana L.*).

No natural waterways were identified on the site. The site is, however, surrounded by man-made water canals/furrows and other developed agricultural lands. The site is previously disturbed by agricultural crop cultivation in the northern area of the footprint.

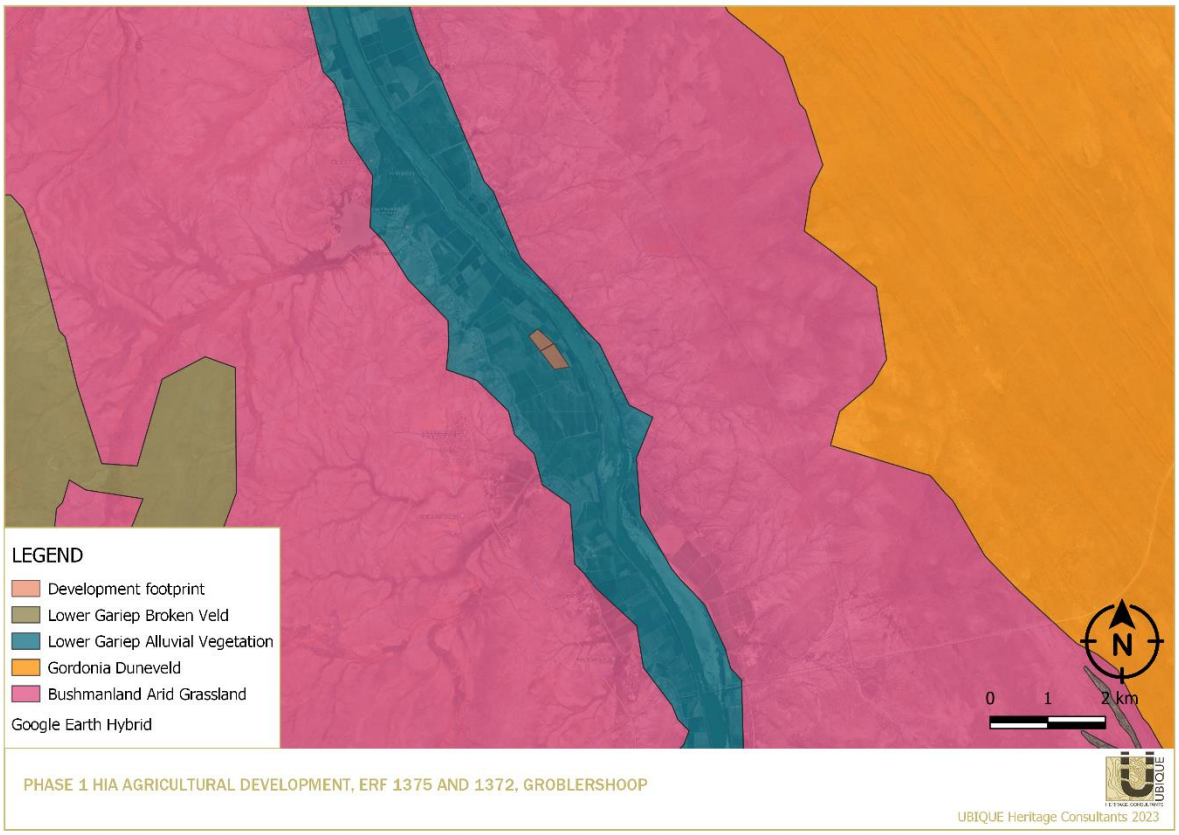


Figure 7 *Indication of the vegetation types in and around the study area (namely Lower Gariep Broken Veld, Lower Gariep Alluvial Vegetation, Gordonia Duneveld, and Bushmanland arid Grassland).*

Figure 8 *Views of the affected development area.*

7.3 Identified heritage resources

7.3.1. Stone Age Identified

No Stone Age Resources like isolated or scattered lithic material or knapping sites were recorded within the development footprint.

7.3.2. Historical/Recent Resources Identified

HISTORICAL PERIOD RESOURCES IDENTIFIED					
SITE ID #	DESCRIPTION		PERIOD	LOCATION	FIELD RATING/ SIGNIFICANCE/ RECOMMENDED MITIGATION
GH004	Type feature	Midden	Ca. 1950's to 2000's	**28° 44' 22.9" S 21° 51' 19.7" E**	Field rating IVC Low Significance
	Material	Modern. Traces of historical period debris.			
	N in m².	15 m².			

HISTORICAL PERIOD RESOURCES IDENTIFIED

SITE ID #	DESCRIPTION		PERIOD	LOCATION	FIELD RATING/ SIGNIFICANCE/ RECOMMENDED MITIGATION
	Context	In context with a modern house ruin (GH001)			No mitigation required.
	Additional	Likely multiple occupations from the historical period to recent times			
GH007	Type feature	Old stone (Dolerite) foundation of square house structure with the adjacent foundation of an outer building, possibly a store room or toilet.	Ca. 1930 to 1960s	**28° 44' 29.4" S 21° 51' 26.5" E**	Field rating IVB Medium significance Must be recorded and requires a permit before destruction.
	Material	Stone Foundation 5m x 5m			
	N in m².	N/A			
	Context	In context with midden recorded at GH008. Historical workers house, probably from the 1930s or later towards the 1950s.			
	Additional	Developments along this river area commenced after the Boegoeberg dam's building during the 1920s-1930s. Canals and furrows were excavated by hand by Afrikaners after the ABW and WW1.			
GH008	Type feature	Midden	Ca. 1930 to 1960s	**28° 44' 29.4" S 21° 51' 25.8" E**	Field rating IVB Medium significance Must be recorded and requires a permit before destruction.
	Material	Historic period debris			
	N in m².	20/m²			
	Context	In context with foundation recorded at GH007.			
	Additional	Midden related to the stone foundation. Historical objects on the surface are visible.			
GH010	Type feature	Hole-in-cap tin	Ca. 1920s to 1950s	**28° 44' 33.2" S 21° 51' 28.1" E**	Field rating IVC Low Significance No mitigation required.
	Material	Metal			
	N in m².	1 in 20m²			
	Context	Probably in context with stone foundations recorded above.			
	Additional	These types of tin cans were produced since ca. 1860s, but this artefact can only be related to the developments along the river since the 1920s and later towards the 1950s			
GH011	Type feature	Old stone (Dolerite) foundation of the square house structure. No other	Ca. 1920s to 1950s	**28° 44' 27.7" S 21° 51' 25.9" E**	Field rating IVB Medium significance

HISTORICAL PERIOD RESOURCES IDENTIFIED

SITE ID #	DESCRIPTION		PERIOD	LOCATION	FIELD RATING/ SIGNIFICANCE/ RECOMMENDED MITIGATION
		foundations are located adjacent and in context with this foundation.			Must be recorded and requires a permit before destruction.
	Material	Stone Foundation 5m x 5m			
	N in m².	N/A			
	Context	In context with midden recorded at GH012. Historical workers house probably from the 1930s or later towards the 1950s.			
	Additional	Developments along this river area commenced after the Boegoeberg dam's building during the 1920s-1930s. Canals and furrows were excavated by hand by Afrikaners after the ABW and WW1.			
GH012	Type feature	Midden	Ca. 1920s to 1950s	**28° 44' 27.6" S 21° 51' 25.8" E**	Field rating IVB Medium significance Must be recorded and requires a permit before destruction.
	Material	Historical period debris			
	N in m².	20/m²			
	Context	In context with foundation recorded at GH011.			
	Additional	Midden related to the stone foundation. Historical objects on the surface are visible.			
GH013	Type feature	Midden	Ca. 1920s to 2000s	**28° 44' 22.7" S 21° 51' 19.9" E**	Field rating IVC Low Significance No mitigation required.
	Material	Scatters of modern and historical artefacts. Context and matrix are relatively disturbed, which makes provenance complex.			
	N in m².	10/m²			
	Context	Context disturbed. This midden might be evident of multiple occupations through time since the 1930s. Lower strata should reveal the theory. Surface deposits are mainly more modern and in context with the more modern architecture of the existing house ruin recorded at GH001 and objects recorded at GH002.			
	Additional	Farm workers house			

Figure 9 *Identified Heritage resources on Erf 1375 and 1372*

7.4 Discussion

7.4.1. Archaeological features

7.4.1.1. Prehistorical

No Prehistoric Period Resources, such as isolated or scattered lithic material or knapping sites were recorded within the development footprint.

7.4.1.2. Historical

Two historic period structures (GH007 and 011) were identified. The midden features identified at GH008 and 012 are related to these structures. GH007 is an old stone (Dolerite) foundation of a square house structure with an adjacent foundation of an outer building, possibly a store room or toilet. The cultural material from GH008 and GH007 dates around the 1930s to 1960s. GH011 is also an old stone foundation of a square house. However, no other foundations or structural features were located in its vicinity. The midden, GH012, is in context with this structure — the debris from the midden dates from the 1920s to the 1950s.

The historical period resources at GH007, 008, 011 and 012 are given a 'General' Protection B (Field Rating IV B). This means they are of medium significance and should be recorded before destruction. As these resources are older than 60 years, a permit is required from the Northern Cape Provincial Heritage Authority (NBKB).

Figure 10 A selection of photographs of the identified Historic Period resources rated IVB

Two additional middens were identified, namely GH004 and GH013. GH004 is in context with a modern structure found nearby. The debris from this midden is contemporary, with traces of historical period debris, likely evidence of multiple occupation periods. It is dated from the 1950s to the 2000s. GH013 is also a midden. However, this midden's context and matrix have been disturbed, making provenance complex. The midden is likely evident in multiple occupations from the 1930s onward. Surface deposits are contemporary debris and in context with the more modern architecture of the existing house ruin. A hole-in-cap tin can was recorded at GH010. No other cultural material was recorded nearby, although it is believed to be in context with the stone foundations described above.

The historical period resources at GH004, 010 and 013 are given a 'General' Protection C (Field Rating IV C). This means that it has been sufficiently recorded (in Phase 1). It requires no further action.

Figure 11 *A selection of photographs of the identified Historic Period resources rated IVC*

Figure 12 *Modern Structure (GH001)*

7.4.2. Palaeontological resources

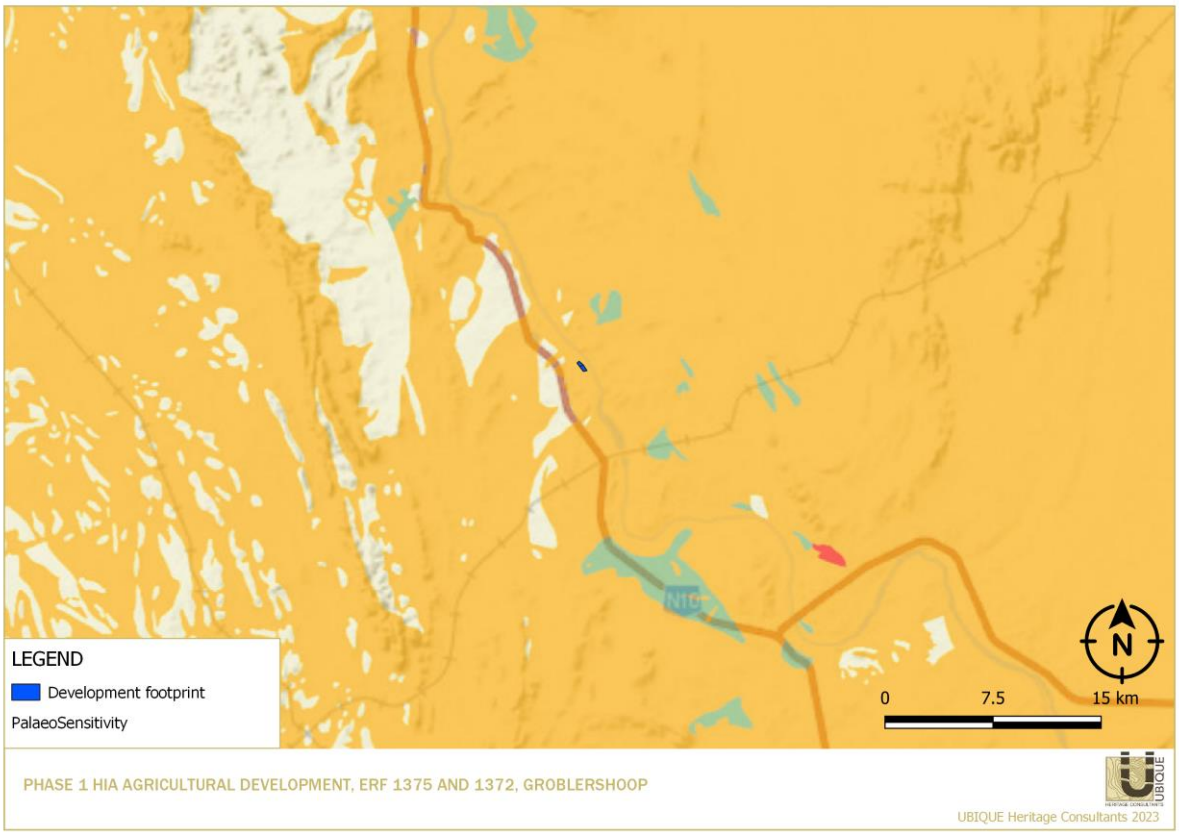


Figure 13 *The Heritage Paleo screening tool and SAHRIS PalaeoSensitivity Map, indicating Medium (yellow), and Low (green) palaeontological significance in the study area, (https://screening.environment.gov.za/; https://sahris.sahra.org.za/map/palaeo).*

Elize Butler from Banzai Environmental conducted a palaeontological desktop assessment for the development footprint (see Appendix A). The development is underlain by superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation (Kalahari Group). The updated geology of the area indicates that the Groblershoop Formation of the Brulpan Group underlies the proposed development. The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (Almond et al., 2013; SAHRIS website), while the suggested location is classified as having a Medium Palaeontology Theme Sensitivity in the DEA Screening Report. (Butler 2023 Appendix A).

8. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

Description	Development Impact		Mitigation	Field rating/ Significance
Archaeological				
1. Historical Period resources GH004, 010, 013	Nature	Neutral	No mitigation required.	Field rating IVC Low significance
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		
2. Historical period resources at GH007, 008, 011, 012	Nature	Negative	Should be recorded and requires a permit before destruction.	Field rating IVB Medium significance
	Extent	Medium		
	Duration	High		
	Intensity	High		
	Potential of impact on irreplaceable resource	High		
	Consequence	High		
	Probability of impact	High		
	Significance	High		
Palaeontological				
3. The Palaeontological Sensitivity. An overall low palaeontological sensitivity is allocated to the development footprint.	Nature	Neutral	No mitigation required.	N/A
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		

The Historical period resources recorded at sites GH004, 010 and 013 are **not conservation worthy, and therefore, the impact is negligible.**

However, the two structural features and middens (GH007, 008, 011 and 012) have been given a field rating of IVB (General Protection). These resources are older than 60 years of age and will **be impacted negatively by development**. These resources are of **medium significance. Therefore, they must be recorded and require a permit before destruction.**

Regarding the impact on palaeontological resources, the proposed development is underlain by superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation (Kalahari

Group). Updated geology of the area indicates that the Groblershoop Formation of the Brulpan Group underlies the proposed development. A **Low Palaeontological Significance** has been allocated to the proposed development area, and development **will not negatively impact palaeontological resources** (Butler 2023).

9. RECOMMENDATIONS

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

1. The historic period resources identified (GH004, 010 and 013) that have been given a field rating of IVC are considered low significance and sufficiently recorded. These cultural resources are of **low significance and therefore considered not to be conservation worthy. No further mitigation is recommended concerning these resources.**

2. The two structural features and associated middens (GH007, 008, 011 and 012) have been given a field rating of IVB. These resources are of **medium significance** and will be impacted **negatively by development. Therefore, they need to be recorded and require a permit from the Northern Cape Provincial Heritage Authority (NBKB) before destruction. Alternatively, a 30 m buffer zone can be implemented.**

3. The modern structure and associated material are considered **Non-Conservation Worthy,** as it is not older than 60 years and therefore has **no archaeological/cultural significance. No mitigation is required.**

4. Due to the **low palaeontological significance** of the proposed development, it is considered that the proposed development will not negatively impact the area's palaeontological resources. Therefore**, in terms of palaeontology, the proposed development may continue**. It is, however, recommended that if fossil remains or traces are discovered during any phase of construction, either on the surface or exposed by excavations, the Chance Find Protocol must be implemented by the ECO or site manager in charge of these developments (Butler 2023).

5. Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490) must be alerted immediately as per section

36(6) of the NHRA. Depending on the nature of the finds, a professional archaeologist or palaeontologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources are of archaeological or palaeontological significance, a Phase 2 rescue operation may be required, subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred due to such oversights.

10. CONCLUSION

This HIA has identified several historic period resources that are older than 60 years on Erf 1375 and 1372 that will be impacted negatively by the proposed development. These resources are of medium significance (General protection IVB) and should thus be recorded before destruction. No additional cultural/heritage resources worthy of conservation that will be negatively impacted by development have been identified. The proposed agricultural development on Erf 1375 and 1372 Groblershoop, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province, may continue, provided the recommendation stipulated within this report and the subsequent SAHRA decision are followed.

11. BIBLIOGRAPHY

ACRM. 2015. Archaeological Impact Assessment, Proposed borrow pit (Karusa R354) on the Farm Karreebosch 200/1 near Sutherland, Northern Cape. Unpublished report. Agency for Cultural Resource Management: Rondebosch.

Beaumont, P. 2007. Phase 1 Heritage Impact Assessment Report on the Farm Eureka 200 near Kimberley, Frances Baard District Municipality, Northern Cape Province. Unpublished report. McGregor Museum: Kimberley.

Beaumont, P.B. 2008. Phase I Archaeological Impact Assessment Report on a Portion of the Farm 292 near Groblershoop, Karoo District Municipality, Northern Cape. Unpublished report.

Beaumont, P.B., Smith, A.B. & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In Smith, A.B. (Ed.). *Einiqualand: Studies of the Orange River frontier*. University of Cape Town Press: Cape Town.

Binneman, J. F. 1995. *Symbolic construction of communities during the Holocene Later Stone Age in the South–Eastern Cape.* Unpublished PhD thesis. Johannesburg: University of the Witwatersrand.

Butler, E. 2023. Palaeontological Desktop Assessment Proposed Agricultural Development Near Groblershoop, In The Northern Cape Province. Unpublished report. Bloemfontein: Banzai Environmental.

Coertze, P.J. & Coertze, R.D. 1996. *Verklarende vak woordeboek vir Antropologie en Argeologie*. R.D. Coertze: Pretoria.

De Bruyn, C. 2019. Heritage Impact Assessment for the proposed mining rights on the farm Waterkloof 95 located between Griekwastad and Groblershoop in The Pixley Ka Seme District Municipality within the Northern Cape Province. Unpublished report. NGT. Johannesburg, Northcliff.

De Jong, R.C. 2010. Heritage impact assessment report: proposed manganese and iron ore mining right application in respect of the remainder of the farm Paling 434, Hay registration division, Northern Cape. Unpublished report. Cultmatrix: Pretoria.

Deacon, H.J. & Deacon, J. 1999. *Human Beginnings in South Africa: Uncovering the secrets of the Stone Age.* David Phillips Publishers: Cape Town.

Dreyer, C. 2006. First phase archaeological and cultural heritage assessment of the proposed Concentrated Solar Thermal Plant (CSP) at the farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape. Unpublished EIA report. Bohlweki Consultants: Johannesburg.

Dreyer, C. 2008a. First Phase archaeological and cultural heritage assessment of the proposed upgrading of the R358 road and borrow pit sites between Pofadder and Onseepkans, Northern Cape. Unpublished report. Bloemfontein.

Dreyer, C. 2008b. First phase archaeological and cultural heritage assessment of the proposed residential developments at a portion of the remainder of the farm Bestwood 459RD, Kathu, Northern Cape. Unpublished report. EIA Report for Cultmatrix cc (Heritage Consultants) Pretoria and Rock Environmental Consulting, Pretoria.

Dreyer, C. 2012. First phase archaeological and cultural heritage assessment of the proposed water pipeline from Sanddraai 391 to Bokpoort 390, Groblershoop, Northern Cape. Unpublished EIA Report. SSI Engineers & Environmental 14 Consultants: Sandhurst.

Dreyer, C. 2013 (Revised). First phase archaeological & heritage assessment of the proposed Garona – Ferrum transmission line, Northern Cape. Unpublished report. EIA Report for Envirolution Consultants, Johannesburg.

Dreyer, C. 2014a. First phase archaeological & heritage assessment of the proposed Ferrum (Kathu) – Nieuwehoop (Kenhardt) 400kV transmission line, Northern Cape. Unpublished report. EIA Report for Envirolution Consulting, Mondeor, Johannesburg.

Dreyer, J. 2014b. First phase archaeological & heritage investigation of the proposed PV energy developments at the farm Sanddraai 391 near Groblershoop, Northern Cape Province. Unpublished report. EIA Report for Royal Haskoning DHV, Woodmead, Gallo Manor.

Dreyer, C. 2015. First Phase Archaeological & Heritage Assessment Of The Proposed Bokpoort II 300mw Combined 2 X 75 Pv & 150 Mw Csp Tower Solar Development On The Remainder Of The Farm Bokpoort 390, Groblershoop, Northern Cape Province. Unpublished report.

Eldredge, E.A. 1987. Drought, famine and disease in nineteenth-century Lesotho. *African Economic History*, (16): 61-93.

Engelbrecht, J. & Fivaz, H. 2018. *Phase 1 HIA Report Plot 1178 Kakamas South, Northern Cape. Unpublished report.* UBIQUE Heritage Consultants: Roodepoort.

Engelbrecht, J. & Fivaz, H. 2019. Phase 1 HIA report Farm 387 portion 18 Groblershoop Northern Cape. Version 2. Unpublished report. UBIQUE Heritage Consultants. Roodepoort.

Fivaz, H. & Engelbrecht, J. 2020. Phase 1 HIA Report !Kheis Township Expansion Groblershoop Northern Cape Proposed Township Expansion On Portion 16 Farm Boegoebergnedersetting Re/48, Groblershoop, !Kheis Local Municipality, Zf Mgcawu District Municipality, Northern Cape. Unpublished report. UBIQUE Heritage Consultants: Roodepoort.

Hall, M. 1987. *The changing past: farmers, kings and traders in southern Africa. 200-1860*. Cape Town: David Philip.

Huffman, T. 2002. Regionality in the Iron Age: the case of the Sotho-Tswana. *Southern African Humanities,* 14: 1–22.

Huffman, T. 2007. *Handbook to the Iron Age*. Pietermaritzburg: University of Kwazulu-Natal Press.

Kaplan, J. 2008. Phase 1 Archaeological Impact Assessment proposed construction of a Water Treatment Plant and Supply Pipeline from Keimoes to Kenhardt, Northern Cape Province. Unpublished report. Agency for Cultural Resource Management: Riebeek West.

Kaplan, J. 2012b. Archaeological Impact Assessment, the proposed Keren Energy Keimoes Solar Farm on Erf 666 Keimoes, Northern Cape Province. Unpublished report. Agency for Cultural Resource Management: Rondebosch.

Kaplan, J. 2013a. Archaeological Impact Assessment, the proposed upgrading of the Louisvale Road Waste Water Treatment Works in Louisvale, Upington, Northern Cape Province. Unpublished report. Agency for Cultural Resource Management: Rondebosch.

Kaplan, J. 2013b. Archaeological Impact Assessment the proposed upgrading of the KWV Upington Effluent Management Facility, Northern Cape Province. Unpublished report. Report prepared for EnviroAfrica cc. ACRM: Cape Town.

Klein, R. G. 2000. The Earlier Stone Age of Southern Africa. *The South African Archaeological Bulletin*, 27(172): 107-122.

Kruger, N. 2015a. Proposed Photovoltaic power plant development on Portion 40 of the farm Eenduin, Kai Garib Local Municipality, Siyana District Municipality Northern Cape Province. Unpublished report. Albebbaran SA (Pty) Ldt. Pretoria.

Kruger, N. 2015b. Archaeological Impact Assessment (AIA) of a Demarcated surface portion on the Farm Avondale 410 for the proposed Avondale 1 Photovoltaic Power Plant & 132kV Power Lines

development, //Khara Hais Local Municipality, ZF Mgcawu district Municipality, Northern Cape Province. Unpublished report. Pretoria.

Kruger, N. 2018. Archaeological Impact Assessment (AIA) for the Biesieputs Prospecting Project on a portion of the farm Biesieputs 67 in the ZF Mgcawu District Municipality, Northern Cape Province. Unpublished report. Pretoria.

Lombard, M., Wadley, L., Deacon, J., Wurz, S., Parsons, I., Mohapi, M. Swart, J. & Mitchell, P. 2012. South African and Lesotho Stone Age sequence updated. *South African Archaeological Bulletin* 67: 123-144.

Mitchell, P. 2002. *The archaeology of Southern Africa*. Cambridge: Cambridge University Press.

Mlilo, T. 2019. Phase 1 Archaeological Impact Assessment Report for Prospecting right application for various minerals (NC12177PR and NC12215PR) in ZF Mgcawu Magisterial District in Kai.! Garib Local Municipality Northern Cape Province. Unpublished report. Integrated Specialists Services (PTY) LTD: Midrand.

Morris, D. 1988. Engraved in Place and Time: A Review of Variability in the Rock Art of the Northern Cape and Karoo. *The South African Archaeological Bulletin,* 43(148): 109-120.

Morris, D. 2012. Archaeological Impact Assessment, Phase I: 15km Water Pipeline across farms Sanddraai 391 and Bokpoort 390 near Groblershoop, Northern Cape. Unpublished Report. McGregor Museum: Kimberley.

Morris, D. 2013a. RE Capital 3 Solar Development on the property Dyason's Klip west of Upington, Northern Cape: Archaeological Impact Assessment – proposed 'central' development footprint. Unpublished report. McGregor Museum: Kimberley.

Morris, D. 2013b. Heritage Impact Assessment: Proposed Aggeneys Photovoltaic Solar Energy Facility at Bloemhoek near Aggeneys, Northern Cape Province. Unpublished report. McGregor Museum: Kimberly.

Morris, D. 2013c. Heritage Impact Assessment for Four Proposed Photovoltaic Solar Energy Facilities on the farm Zuurwater near Aggeneys, Northern Cape Province (Expanded Survey). Unpublished report. McGregor Museum: Kimberly

Morris, D. 2013d. RE Capital 3 Solar Development on the property Dyason's Klip west of Upington, Northern Cape: Scoping phase Heritage Input. Unpublished report. McGregor Museum: Kimberley.

Morris, D. 2013e. AES Solar PV Installation on the property Dabenoris 44 near Aggeneys, Northern Cape: Scoping phase Heritage Input. Unpublished report. McGregor Museum: Kimberly.

Morris, D. 2013f. Proposed development of the Upington Solar Thermal Plants Two and Three within Portion 3 of the Farm McTaggarts Camp 435, west of Upington, Northern Cape: Scoping phase heritage input. Unpublished report. McGregor Museum: Kimberley.

Morris, D. 2014. Archaeological Impact Assessment - ACWA Power Solafrica Bokpoort CSP Power Plant (PTY) LTD: Amended Alignment: Bokpoort Water Pipeline, Groblershoop, Northern Cape. McGregor Museum: Kimberley

Morris, D. 2017a. Skuitdrift 1 solar PV energy Facility near Pofadder, Northern Cape. Unpublished report. McGregor Museum Kimberly.

Morris, D. 2017b. Heritage Impact Assessment of proposed sand mining in the bed of the Hartebees River on Lot 1768 Kakamas South, near Kakamas, Northern Cape. Unpublished Report. McGregor Museum: Kimberley.

Morris, D. 2018a. Heritage Impact Assessment of proposed sand mining in the bed of a spruit on Olywenhoutsdrift-Suid, near Louisvale, Northern Cape. Unpublished report. McGregor Museum: Kimberley.

Morris, D. 2018b. Heritage Impact Assessment of proposed sand mining in the bed of the Donkerhoekspruit on Jannelsepan, near Louisvale, Northern Cape. Unpublished report. McGregor Museum: Kimberley.

Morris, D. 2018c. Heritage Impact Assessment at the site of proposed irrigation development on the farm Openwater near Upington, Northern Cape. Unpublished report. McGregor Museum, Kimberley.

Morris, D. & Beaumont, P.B. 1991. !Nawabdanas: archaeological sites at Renosterkop, Kakamas District, Northern Cape. *South African Archaeological Bulletin* 46:115-124.

Orton, J. 2015a. Final Archaeological Survey for the proposed Aggeneys Solar Energy facility, Namakwaland Magisterial District, Northern Cape. Unpublished Report. ASHA Consulting: Cape Town.

Orton, J. & Webley, L. 2013. Heritage Impact Assessment for the Proposed Boegoeberg Hydropower Station near Groblershoop, Northern Cape. Unpublished report. ACO Associates cc: Cape Town.

Penn, N. 2005. *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*. Athens. Ohio University Press and Double Storey Books: Ohio and Cape Town.

Ross, R. 1975. The!Kora Wars on the Orange River, 1830-1880. The Journal of African History, 16 (4): 561-576.

Van der Ryst, M.M. & Meyer, A. 1999. *Die Ystertydperk. Bergh, J.S. (red.). Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies.* Pretoria: J.L. van Schaik.

Van der Walt, J. 2012. Archaeological Impact Assessment Report for the Proposed re-use of a hard rock quarry on the Farm Buchuberg 296 in the Hay Magisterial District 24km East of Groblershoop. Unpublished report. Heritage Contracts and Archaeological Consulting.

Van Ryneveld, K. 2007. Phase 1 archaeological impact assessment: Portion of the farm Boksputs 118, Groblershoop, Northern Cape, South Africa. Unpublished report.

Van Schalkwyk, J. A. 2019. Phase 1 Cultural Heritage Impact Assessment: Prospecting right application with bulk sampling on various portions of the Farms Zonderhuis 402, Onder Plaats 401 and Namakwari 656, Siyanda District Municipality, Northern Cape Province. Unpublished report. Pretoria.

Van Schalkwyk, J. A. 2020. Phase 1 Cultural Heritage Impact Assessment: The Proposed Bokpoort II PV Solar Power Facilities on the farm Bokpoort 390 near Groblershoop, !Kheis Local Municipality, Northern Cape Province. Unpublished report. Pretoria.

Van Vollenhoven, A. C. 2014. A report on a basic heritage assessment for the proposed Eskom Fibre-Groblershoop 132 Kv power line, Northern Cape Province. Unpublished report. Archaetnos: Groenkloof.

Webley, L. and Halkett, D. 2012. Heritage Impact Assessment: Proposed Loeriesfontein Photo-Voltaic Solar Power Plant on Portion 5 of the Farm Klein Rooiberg 227, Northern Cape Province. Unpublished report. ACO Associates.

Webley, L. 2013. Heritage impact assessment for proposed construction of the ESKOM Groblershoop Substation and the Garona-Groblershoop 132 kV powerline, Groblershoop, Northern Cape. Unpublished report. ACO Associates cc: St James.

Wurz, S., 2013. Technological trends in the Middle Stone Age of South Africa between MIS 7 and MIS 3. *Current Anthropology*, 54(S8): S305-S319.

WEB

https://sahris.sahra.org.za/declaredsites (Accessed 18/08/2022).

https://sahris.sahra.org.za/allsitesfinder (Accessed 17/07/2023).

https://screening.environment.gov.za/ (Accessed 18/07/2023).

https://www.sanbi.org/gardens/free-state/history/ (Accessed 15/08/2023).

APPENDIX A

PALAEONTOLOGICAL DESKTOP ASSESSMENT PROPOSED AGRICULTURAL DEVELOPMENT NEAR GROBLERSHOOP IN THE NORTHERN CAPE PROVINCE.

BANZAI ENVIRONMENTAL

PALAEONTOLOGICAL DESKTOP ASSESSMENT

PROPOSED AGRICULTURAL DEVELOPMENT NEAR GROBLERSHOOP, IN THE NORTHERN CAPE PROVINCE

July 2023

COMPILED FOR: UBIQUE HERITAGE CONSULTANTS

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, Regulations, and all other applicable legislation.
- I will consider, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application.
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not;
- All the particulars furnished by me in this form are true and correct.
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

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

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

Tel: +27 844478759

Email: info@banzai-group.com

SIGNATURE: 

This Palaeontological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

***Table 1**: NEMA Table*	
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii and Section 2 of Report – Contact details and company and Appendix A
(ii) The expertise of that person to compile a specialist report including a curriculum vitae	Section 2 – refer to **Appendix A**
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Methods and TOR
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Desktop Assessment
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 Approach and Methodology
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternative;	Section 1 and 9
(g) An identification of any areas to be avoided, including buffers	Section 5 No buffers or areas of sensitivity identified
(h) A map superimposing the activity including the associated structures and infrastructure on the	Section 5 – Geological and Palaeontological history

***Table 1**: NEMA Table*	
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**
environmental sensitivities of the site including areas to be avoided, including buffers;	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4.1 – Assumptions and Limitation
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 and 9
(k) Any mitigation measures for inclusion in the EMPr	Section 1 and 9
(l) Any conditions for inclusion in the environmental authorisation	Section 1 and 9
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 1 and 9
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 9
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 1 and 9
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A
(p) A summary and copies if any comments that were received during any consultation process	N/A
(q) Any other information requested by the competent authority.	N/A
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines

EXECUTIVE SUMMARY

Banzai Environmental was appointed by UBIQUE Heritage Consultants to conduct the Palaeontological Desktop Assessment (PDA) to assess the proposed agricultural development on Erf no 1375 and 1372 near Groblershoop in the !Kheis local municipality within the MgCawu District Municipality in the Northern Cape Province. This PIA is required to confirm whether fossil material may potentially be present in the planned development area and to assess the potential impact of the proposed development on the local palaeontological heritage in order to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA).

The development is underlain by superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation (Kalahari Group). Updated geology of the area indicates that the proposed development is underlain by the Groblershoop Formation of the Brulpan Group. The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (Almond *et al.*, 2013; SAHRIS website), while the suggested location is classified as having a Medium Palaeontology Theme Sensitivity in the DEA Screening Report.

A Low Palaeontological Significance has been allocated to the proposed development. The construction of the project may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage. If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations, the Environmental Control Officer (ECO) in charge of these developments must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carried out by a palaeontologist.

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

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GLOSSARY OF TERMS

Fossil

Mineralized bones of vertebrate and invertebrate animals, as well as plants. A trace fossil is the traces of animals/plants preserved in stone.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act No 25 of 1999).

Heritage resources

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

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

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past (other than fossil fuels or fossiliferous rock intended for industrial use) and any site which comprises of fossilised remains or traces of past life.

LIST OF ABBREVIATIONS

BA	Basic Assessment
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
CA	National Competent Authority
ECO	Environmental Control Officer
EMPr	Environmental Management Programme
ESO	Environmental Site Officer
HIA	Heritage Impact Assessment
Ma	Millions of years ago
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PIA	Palaeontological Impact Assessment
PSSA	Palaeontological Society of South Africa
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
S&EIA	Scoping & Environmental Impact Assessment
ToR	Terms of Reference

1 INTRODUCTION

Silver Moon Investments 358 CC proposes the establishment of vinyards on Erf 1372 and Erf 1375 near Groblershoop in the !Kheis local municipality within the MgCawu District Municipality in the Northern Cape Province (Figure 1-2). Ubique Consultants was appointed to conduct the Heritage Impact Assessment (HIA) for the Project, and Banzai Environmental was in turn, appointed to conduct the Palaeontological Desktop Assessment (PDA).

1.1 Project Information

Table 2: Project Particulars

Project description	
Project name	Proposed agricultural development.
Description	Proposed development and establishment of vineyards on this 14ha of land. Crop cultivation.
Developer	
Dirk Louw: Silver Moon Investments 358 CC	
Contact information	Cell: 076 781 9084/061 509 6479: Po box 339 Groblershoop 8850: Email: Louwdirk44@yahoo.com
Development type	Agricultural/Vineyard development
Landowner	
Dirk Louw: Silver Moon Investments 358 CC	
Contact information	Cell: 076 781 9084/061 509 6479: Po box 339 Groblershoop 8850: Email: Louwdirk44@yahoo.com
Consultants	
Environmental	Enviroafrica cc.
Heritage and archaeological	UBIQUE Heritage Consultants
Palaeontological	Banzai Environmental (Pty) Ltd
Property details	
Province	Northern Cape
District municipality	Z.F. McGawu
Local municipality	!Kheis
Topo-cadastral map	1:50 000
Farm name	ERF NO. 1375= 6.80.ha ERF NO. 1372 =6.16 ha = 14.8ha
Closest town	Groblershoop
GPS Co-ordinates	**28º 44' 22.1" S** **21º 51' 19.6" E**
Property size	166 ha
Development footprint size	14,8 ha
Land use	
Previous	Agriculture
Current	Agricultural
Rezoning required	No
Sub-division of land	No

Development criteria in terms of Section 38(1) NHRA	Yes/No
Construction of a road, wall, power line, pipeline, canal or other linear forms of development or barrier exceeding 300m in length.	Yes
Construction of bridge or similar structure exceeding 50m in length.	No
Construction exceeding 5000m ².	Yes
Development involving three or more existing erven or subdivisions.	No
Development involving three or more erven or divisions that have been consolidated within the past five years.	No
Rezoning of site exceeding 10 000m ².	No
Any other development category, public open space, squares, parks, recreation grounds.	No

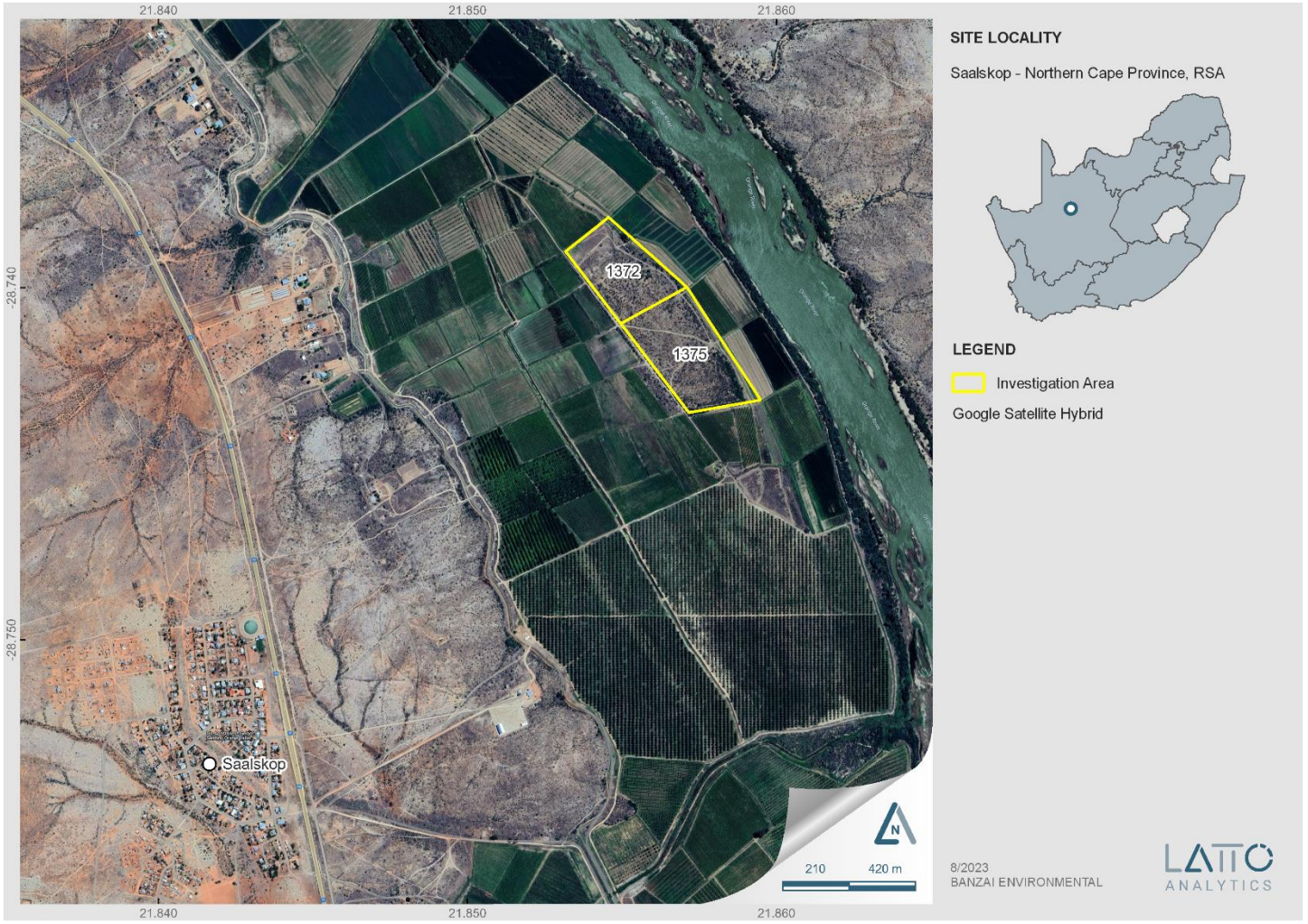

***Figure 1**:Proposed agricultural development on Erf 1372 and Erf 1375 near Groblershoop in the !Kheis local Municipality within the MgCawu District Municipality in the Northern Cape Province.*

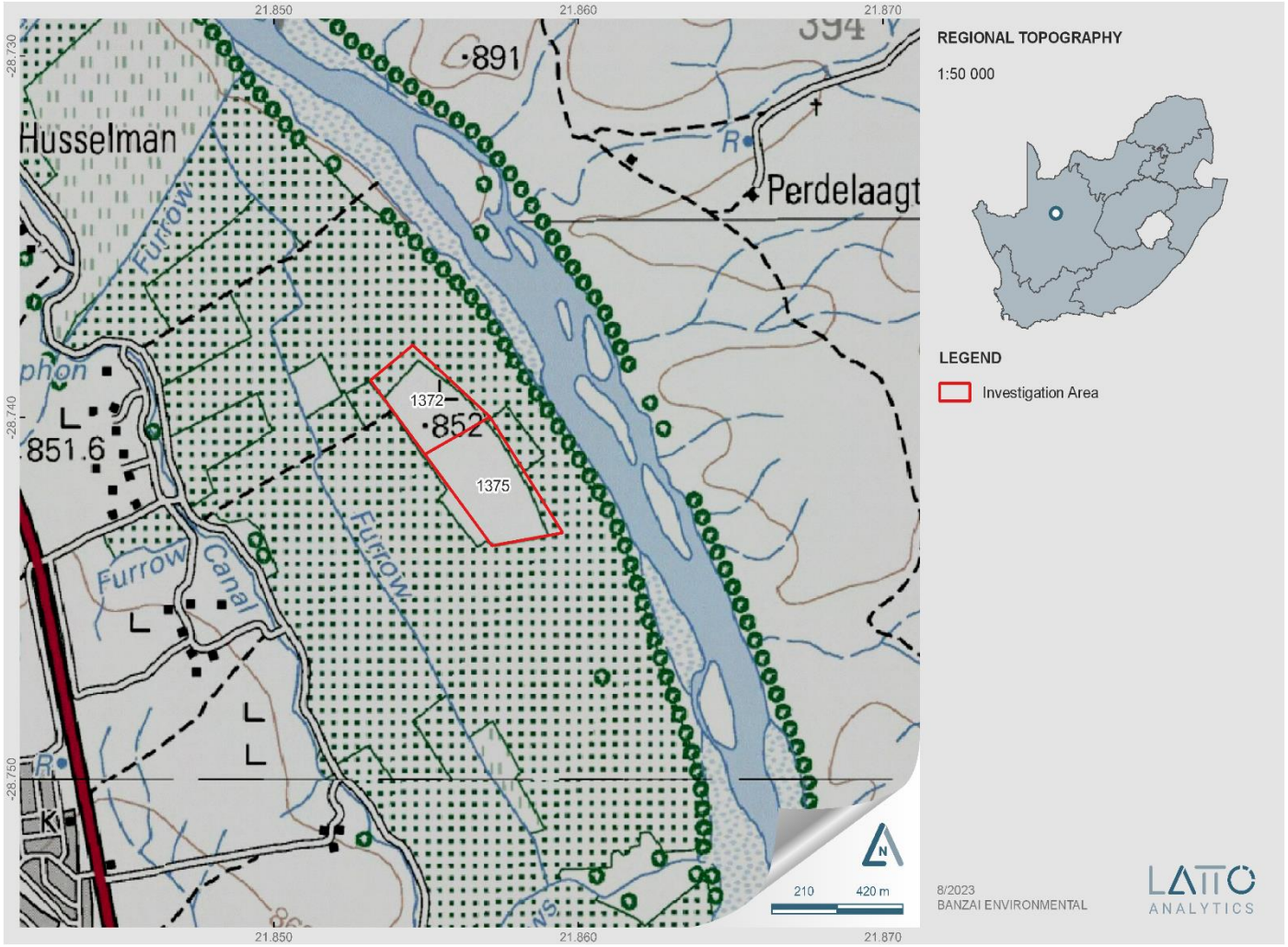

***Figure 2**: Regional topography of the agricultural development on Erf 1372 and Erf 1375 near Groblershoop in the !Kheis local Municipality within the MgCawu District Municipality in the Northern Cape Province.*

2 SPECIALIST CREDENTIALS

Mrs. Elize Butler conducted the current study. For developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga, she has completed almost 300 palaeontological impact assessments. She has an MSc (*cum laude*) in Zoology with a focus in Palaeontology from the University of the Free State in South Africa, and she has more than 30 years of experience in the field. She has knowledge of finding, collecting, and curating fossils. She began conducting PIAs in 2014 and has been a member of the Palaeontological Society of South Africa (PSSA) since 2006.

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act No. 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include "all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens".

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

- National Environmental Management Act (NEMA) Act No. 107 of 1998
- National Heritage Resources Act (NHRA) Act No. 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act No. 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act No. 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act No. 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36
- Heritage Resources Management – Section 38

The NEMA (No. 107 of 1998) states that an integrated EMP should (23:2 (b)) "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*".

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies a comprehensive and legally compatible PIA report has been compiled.
Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

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

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.
- the construction of a bridge or similar structure exceeding 50 m in length.
- any development or other activity which will change the character of a site—
    - exceeding 5 000 m^2 in extent; or
    - involving three or more existing erven or subdivisions thereof; or
    - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority or
    - the re-zoning of a site exceeding 10 000 m^2 in extent or

any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 METHODS AND TERMS OF REFERENCE

This PIA assesses the development's potential impact on the fossil heritage. This Palaeontological Assessment is part of the HIA Report. The PIA's goals are to: 1) identify the palaeontological significance of the rock formations in the footprint; 2) evaluate the palaeontological magnitude of the formations; 3) clarify the impact on fossil heritage; and 4) make recommendations for how the developer might protect and minimize potential harm to fossil heritage, according to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports".

Calculations of the palaeontological state of each rock segment and the potential impact of development on fossil history take into account the palaeontological status of the rocks, the type of development, and the amount of bedrock removed.

The Provisional DFFE Screening Tool, the SAHRIS Palaeosensitivity map, all Palaeontological Impact Assessment reports for the same area, Google Earth images, topographical and geological maps, as well as academic articles about specimens from the development area and Assemblage Zones, are all used to create scoping reports.

When the development footprint has a moderate to high palaeontological sensitivity, a field-based assessment is necessary. A desktop or field assessment of the exposed rock is used to evaluate the significance of the proposed development's impact, and recommendations for more research or mitigation are made. Excavations for the project often only take place during the building phase, changing the terrain and destroying or permanently encasing fossils at or below the ground surface. Then, access to Fossil Heritage will no longer be available for academic study.

When doing a site investigation, a palaeontologist examines the local development as well as the quantity and variety of fossils found there. This can be demonstrated by looking at representative fossiliferous rock exposures (most igneous and metamorphic rocks are not fossiliferous, whereas sedimentary rocks contain fossil heritage). Examined rock exposures frequently contain a sizeable portion of the stratigraphic unit, which is primarily made up of recently exposed (unweathered) rock. These exposures may be man-made (such as quarries, open building excavations, even railway and road cuttings) or natural (such as cliffs, and dongas as well as rocky outcrops along stream or river banks). It is usual practice for palaeontologists to record well-preserved fossils (GPS, and stratigraphic data) during field assessment examinations.

Although mitigation is often done prior to construction, it may take place if potentially fossiliferous bedrock is revealed. Fossil collection and documentation are examples of mitigation. A permit from SAHRA must be obtained before beginning any fossil excavation, and the material must be stored at an authorized facility. When mitigation is properly used, it is possible to have a positive impact by raising awareness of the palaeontological past of the area.

By physically evaluating bedrock outcrops to determine their lithology and fossil richness and crisscrossing the development footprint, one can assess an area's fossil potential. Because the presence of fossils at the surface is so unexpected, an average sample size of the region is investigated. To be clear, however, the lack of fossils in a development footprint does not automatically suggest that there is no palaeontologically important material present on the site (on or below the ground surface).

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements;
- Submit a comprehensive overview of all appropriate legislation, guidelines;
- Describe of the proposed project and provide information regarding the developer and consultant who commissioned the study;
- Describe location of the proposed development and provide geological and topographical maps
- Provide palaeontological and geological history of the affected area;
- Identify sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluate the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    a. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity.
    c. Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided);
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Detail the implications of specialist findings for the proposed development (such as permits, licenses etc).

4.1 Assumptions and Limitations

The geology of the area is the focal point of geological maps, and the sheet explanations of the Geological Maps were not intended to focus on palaeontological heritage. Many inaccessible areas of South Africa have never been examined by palaeontologists, and data is typically dependent solely on aerial pictures. Locality and geological information in museums and university databases is out of date, and data acquired in the past is not always adequately documented.

Comparable Assemblage Zones in other places are also used to provide information on the existence of fossils in areas that have not before been recorded. When similar Assemblage Zones and geological formations are used for Desktop studies, it is commonly assumed that exposed fossil exists within the footprint. As a result, a field assessment will improve the accuracy of the desktop evaluation.

5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed agricultural development on Erf 1372 and Erf 1375 near Groblershoop in the !Kheis local Municipality within the MgCawu District Municipality in the Northern Cape Province is depicted on the 1:250 000 Upington 2820 (1988) Geological map (Council of Geoscience, Pretoria) (Figure 3; Table 3). The development is underlain by superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation of the Kalahari Group (Q, yellow). Updated geology of the area is depicted in Figure 4 and indicates that the proposed development in underlain by the Groblershoop Formation of the Brulpan Group. The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (green) (Figure 5, Table 4). The suggested location is classified as having a Medium Palaeontology Theme Sensitivity in the DEA Screening Report, as seen in Figure 6.

The late Cretaceous to Recent Kalahari Group has been reviewed by the following authors: Thomas (1981), Dingle *et al.* (1983), Thomas & Shaw 1991, Haddon (2000) and Partridge *et al.* 2006. The Quaternary Gordonia Formation (Kalahari Group) are dated as Late Pliocene/Early Pleistocene to Recent times by the Middle to Later Stone Age stone tools recovered from them (Dingle et al (1983). Quaternary alluvium could contain fossils of Miocene age (Hendy 1984, Schneider & Marias 2004) The fossil assemblages of the Quaternary are generally Low in diversity and occur over a wide range and mostly has a Moderate Palaeontologically Sensitivity. These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods, and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn corns as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which includes termite and insect's burrows and mammalian trackways. Amphibian and crocodile skeletons have been uncovered where the depositional settings in the past were wetter.

The Quaternary deposits are very important because palaeoclimatic changes are reflected in the different geological formations (Hunter et al., 2006). During the climate fluctuations in the Cenozoic Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Cenozoic but states that climatic changes during the Quaternary Period, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the

Quaternary Period were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth et al., 2004).

Updated geology (Council of Geosciences) indicates that the development is underlain by the Groblershoop Formation (Brulpan Group, Namaqua-Natal Province). This Formation comprises of schistose and quartzitic units. These rocks are about two to one billion years old and are unfossiliferous (Almond and Pether, 2008).

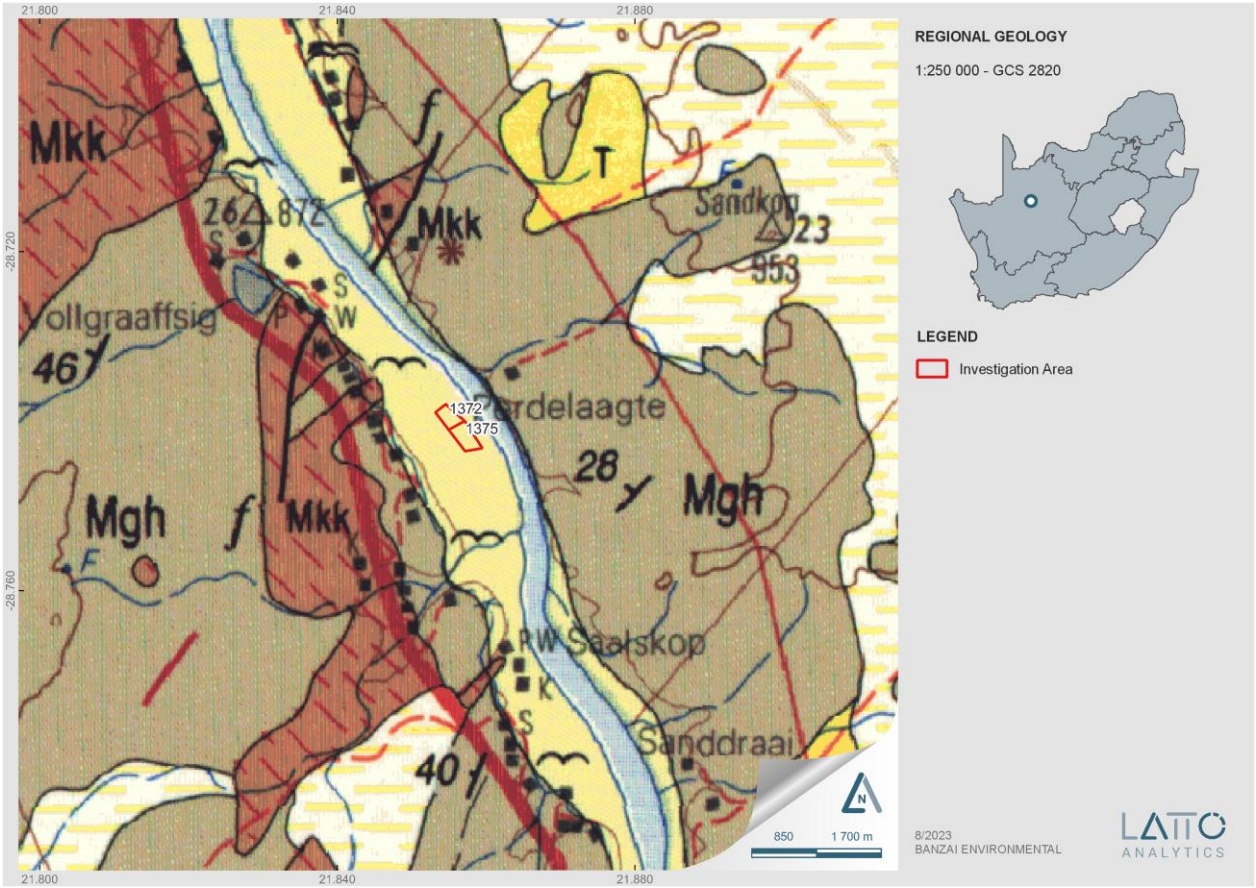

***Figure 3**: Extract of the 1:250 000 Upington 2820 (1988) Geological map (Council of Geoscience, Pretoria) indicates that the proposed development is underlain by superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation (Gordonia Formation, Kalahari Group,(yellow single bird figure).*

Table 3:Legend of the 1:250 000 Upington 2820 Geological map (1998) Geological map (1988) (Council of Geoscience, Pretoria)

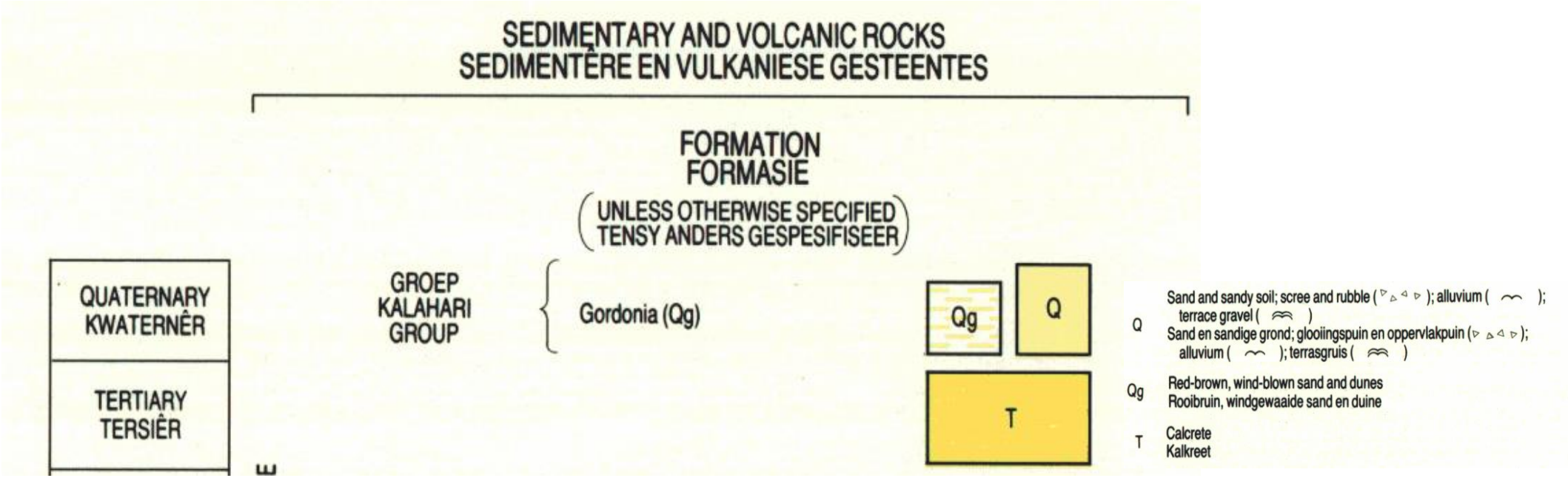

***Figure 4**: Updated geology of the proposed development indicated that the proposed development is underlain by the Groblerhoop Formation of the Brulberg Group.*

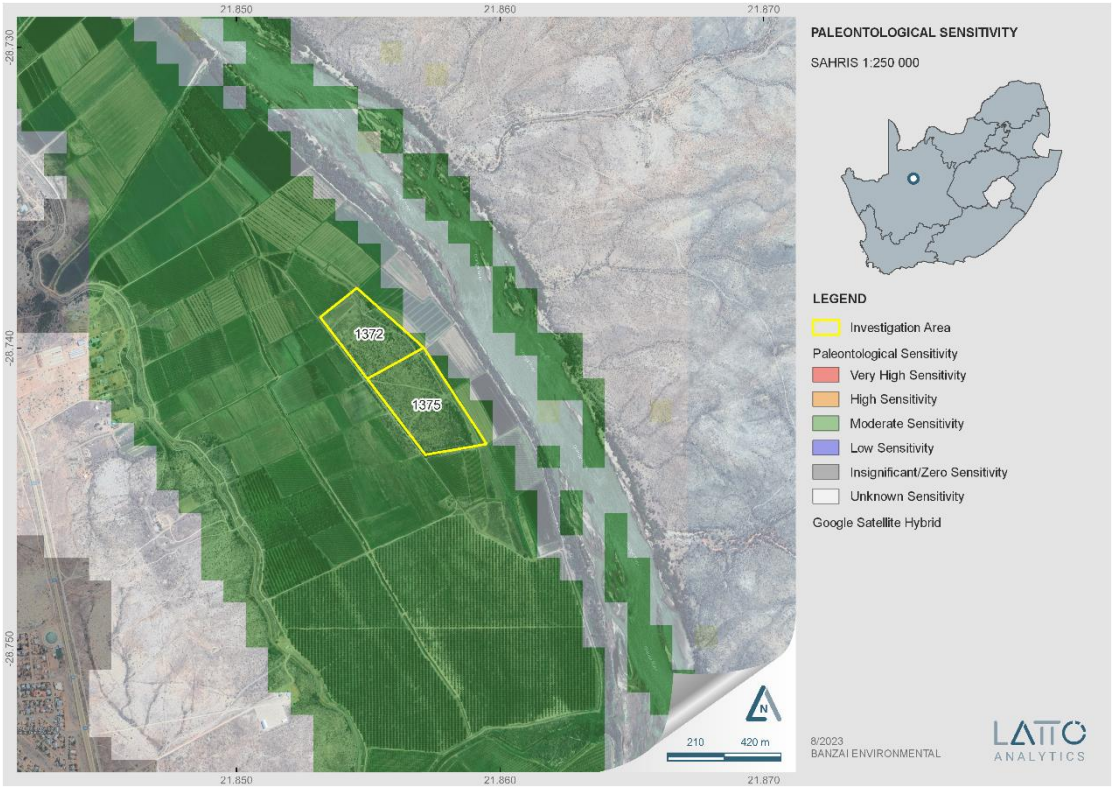

***Figure 5**: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed development in yellow.*

According to the SAHRIS Palaeosensitivity map (**Figure 5)** the proposed development is underlain by sediments with a and Moderate (green) Palaeontological Sensitivity.

Table 4: Palaeontological Sensitivity on SAHRIS

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	**MODERATE**	**Desktop study is required**
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes

		to light, SAHRA will continue to populate the map.

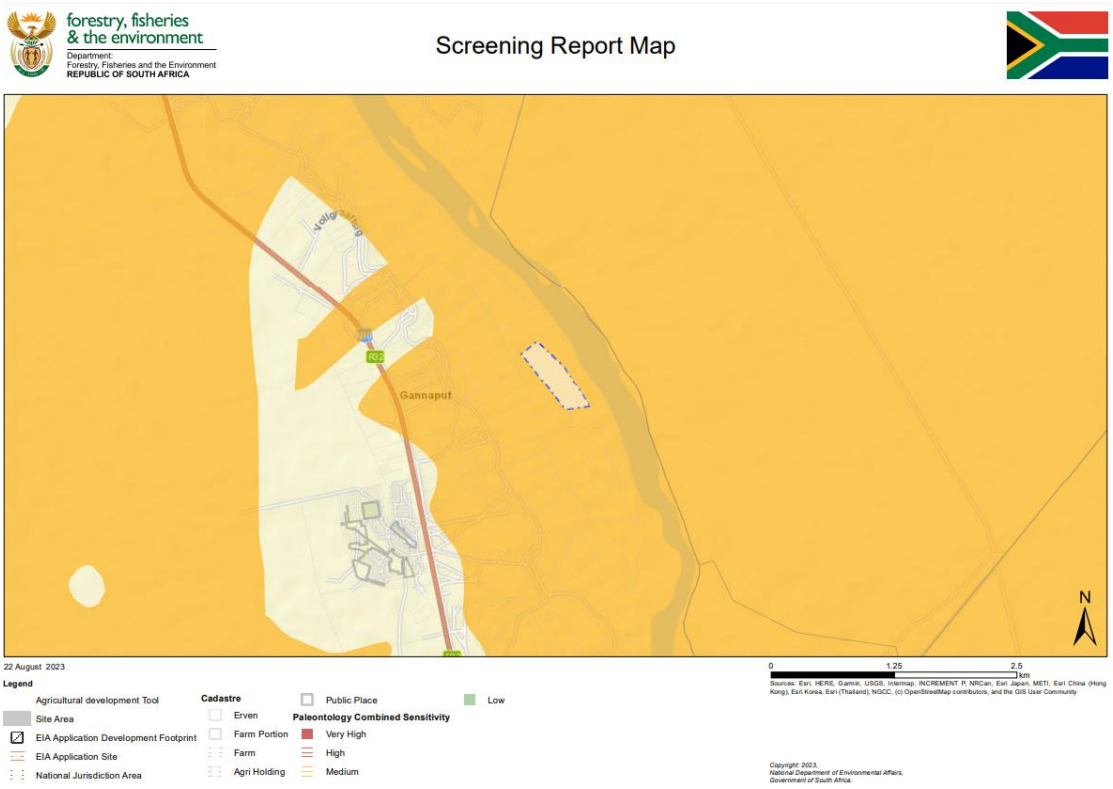

***Figure 6**: Palaeontological Sensitivity generated by the National Environmental Web-Based Screening indicating the Medium Palaeontological Sensitivity of the proposed development.*

6 GEOGRAPHICAL LOCATION OF THE SITE

It is proposed agricultural development on Erf 1372 and Erf 1375 near Groblershoop in the !Kheis local municipality within the MgCawu District Municipality in the Northern Cape Province (Figure 1-2).

7 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- 1: 250 000 West Rand 2626 Geological Map (1986) (Council of Geosciences, Pretoria)

- A Google Earth map with polygons of the proposed development was obtained from Ubique Consultants.
- Updated Geology produced by the Council of Geosciences (Pretoria).
- Palaeosensitivity map on SAHRIS website.
- The National Environmental Web-based Screening Tool.

8 IMPACT ASSESSMENT METHODOLOGY

8.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

• Construction.

• Operation; and

• Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 5: The rating system

NATURE		
The Nature of the Impact is the possible destruction of fossil heritage		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).

3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible, and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		

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

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

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

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

8.2 Summary of Impact Tables

Loss of fossil heritage will be a negative impact. Only the site will be affected by the proposed development. The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures, the damage or destruction of any palaeontological materials will be permanent. Impacts on palaeontological heritage during the construction phase could potentially occur and are regarded as having a Low probability. As fossil heritage will be destroyed the impact is irreversible. The significance of the impact occurring will be low.

Table 6: Summary of Impact Tables

	Site	Probability	Duration	Magnitude	Reversibility	Irreplicable Loss	Cumulative Effect	Impact Significance
Loss of fossil Heritage Disturbance/damage and destruction of fossils at /below surface	1	2	4	2	4	4	2	34
	1	2	4	1	4	4	2	17

9 FINDINGS AND RECOMMENDATIONS

The development is underlain by superficial sediments (alluvium) of the Quaternary to Recent aged Gordonia Formation (Kalahari Group). Updated geology of the area indicates that the proposed development is underlain by the Groblershoop Formation of the Brulpan Group. The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (Almond *et al.*, 2013; SAHRIS website), while the suggested location is classified as having a Medium Palaeontology Theme Sensitivity in the DEA Screening Report.

A Low Palaeontological Significance has been allocated to the proposed development. The construction of the project may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage. If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Control Officer (ECO) in charge of these developments must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a palaeontologist.

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

10 BIBLIOGRAPHY

ALMOND, J.E. 2009. Contributions to the palaeontology and stratigraphy of the Alexander Bay sheet area (1: 250 000 geological sheet 2816), 117 pp. Unpublished report for the Council for Geoscience. Natura Viva cc, Cape Town.

ALMOND, J.E. & PETHER, J. 2008. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp.

ALMOND, J., PETHER, J, AND GROENEWALD, G. 2013. South African National Fossil Sensitivity Map. SAHRA and Council for Geosciences. Schweitzer et al. (1995) pp p288.

ALMOND, J.E. 2011a. Proposed Mainstream solar park near Keimoes, Gordinia District, Northern Cape Province. Preliminary desktop screening assessment, 12 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. & PETHER, J. 2009. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.

ALMOND, J.E. 2011b. Proposed Rooipunt Solar Power Park on Farm Rooipunt 617, near Upington, Gordonia District, Northern Cape Province. Palaeontological specialist study: desktop assessment, 12 pp

ALMOND, J.E. 2012. Proposed upgrading of four road bridges along the N10 between Groblershoop & Lambrechtsdrift, Northern Cape. Recommended exemption from further palaeontological studies & mitigation, 10 pp.

BACKWELL, L.R., T. S. MCCARTHY, L. WADLEY, Z. HENDERSON, C. M. STEININGER, B. DE KLERK, M. BARRÉ, M. LAMOTHE, B. M. CHASE, S. WOODBOURNE, G.J. SUSINO, M.K. BAMFORD, C. SIEVERS, J.S. BRINK, L. ROSSOUW, L. POLLAROLO, G. TROWER, L. SCOTT, F. D'ERRICO. 2014. Multiproxy record of late Quaternary climate change and Middle Stone Age human occupation at Wonderkrater, South Africa. Quaternary Science Reviews. 99: 42–59.

BARNOSKY, A.D. 2005. Effects of Quaternary Climatic Change on Speciation in Mammals. Journal of Mammalian Evolution. 12:247-264

BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Geological Society of South Africa, Marshalltown.

BRINK, J.S. 1987. The archaeozoology of Florisbad, Orange Free State. Memoirs of the National Museum 24: 1 – 151.

BRINK, J.S. 2012. The post-1.0 Ma evolution of large mammal endemism in southern Africa in relation to East Africa and subsequent biogeographic isolation of the Cape coastal region. Quaternary International vol. 279–280: 69.

BRINK, J.S. 2016. Faunal evidence for mid- and late Quaternary environmental change in southern Africa. In: Knight, J. and Grab, S.W. (eds) Quaternary environmental change in southern Africa: physical and human dimensions. Cambridge University Press, pp. 286-307

BRINK, J.S., BERGER, L.R., CHURCHILL, S.E. 1999. Mammalian Fossils From Erosional Gullies (Dongas) In The Doring River Drainage, Central Free State Province, South Africa, pp. 79-90. In: Becker, C., MANHART, H., PETERS, J., SCHIBLER, J. (eds), Historia Animalium ex Ossibus. Beiträge zur Paläoanatomie, Archäologie, Ägyptologie, Ethnologie und Geschichte der Tiermedizin: Festschrift für Angela Von Den Driesch zum 65. Geburtstag. Rahden/Westf.: Verlag Marie Leidorf GmbH.

COPPENS, Y. ET AL. 1978. PROBOSCIDEA. In: V. Maglioand and H.B.S. Cooke (eds). Evolution of African Mammals. Cambridge. Harvard University Press

CORNELL, D.H., THOMAS, R.J., MOEN, H.F.G., REID, D.L., MOORE, J.M., GIBSON, R.L., 2006. The Namaqua-Natal Province. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 325-379

DE RUITER, DARRYL J.; BROPHY, JULIET K.; LEWIS, PATRICK J.; KENNEDY, ALICIA M.; STIDHAM, THOMAS A.; CARLSON, KEELY B.; HANCOX, P. JOHN. 2010. Preliminary investigation of the Matjhabeng, a Pliocene fossil locality in the Free State of South Africa. http://hdl.handle.net10539/13821

DE WIT, M.C.J., MARSHALL, T.R. & PARTRIDGE, T.C. 2000. Fluvial deposits and drainage evolution. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp.55-72. Oxford University Press, Oxford.

DINGLE, R.V., SIESSER, W.G. & NEWTON, A.R. 1983. Mesozoic and Tertiary geology of southern Africa. viii + 375 pp. Balkema, Rotterdam.

DU TOIT, A. 1954. The geology of South Africa. xii + 611pp, 41 pls. Oliver & Boyd, Edinburgh.

HADDON, I.G. 2000. Kalahari Group sediments. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp. 173-181. Oxford University Press, Oxford.

DU TOIT, A.L., 1918. The zones of the Karroo System and their distribution. Proceedings of the Geological Society of South Africa, 21, 17-37.

HENDEY, Q.B. 1984. Southern African late Tertiary vertebrates. In: Klein, R.G. (Ed.) Southern African prehistory and paleoenvironments, pp 81-106. Balkema, Rotterdam. MOEN, H.F.G. 2007. The geology of the Upington area. Explanation to 1: 250 000 geology Sheet 2820 Upington, 160 pp. Council for Geoscience, Pretoria.,

HUNTER, D.R., JOHNSON, M.R., ANHAEUSSER, C. R. AND THOMAS, R.J. 2006. Introduction. (In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J. (Eds), The Geology of South Africa. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria, 585-604.)

KENT, L. E., 1980. Part 1: Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia and the Republics of Bophuthatswana, Transkei, and Venda. SACS, Council for Geosciences.

KLEIN, R.G. 1984. The large mammals of southern Africa: Late Pliocene to Recent. In: Klein, R.G. (Ed.) Southern African prehistory and paleoenvironments, pp 107-146. Balkema, Rotterdam.

LEWIS, PATRICK J.; BRINK, JAMES S.; KENNEDY, ALICIA M.; CAMPBELL, TIMOTHY L. (2011)."Examination of the Florisbad microvertebrates". South African Journal of Science.107(7/8).

MACRAE, C. 1999. Life etched in stone. Fossils of South Africa. 305 pp. The Geological Society of South Africa, Johannesburg.

MARCHETTI, L., KLEIN, H., BUCHWITZ, M., RONCHI, A., SMITH, R.M.H., DE KLERK, E., SCISCIO, L. AND MEIRING, A.J.D. 1955. Fossil Proboscidean teeth and ulna from Virginia, OFS. Navorsinge van die Nasionale Museum, Bloemfontein 1, 187–201.

MAUD, R. 2012. Macroscale Geomorphic Evolution. (In Holmes, P. and Meadows, M. Southern Africa Geomorphology, New trends and new directions. Bloemfontein: Sun Press. p. 7- 21)

MCCARTHY, T. & RUBIDGE, B. 2005. The story of Earth and life: a southern African perspective on a 4.6-billion-year journey. 334pp. Struik, Cape Town

MOEN, H.F.G. (1987). The Koras Group and related intrusive north of Upington: a reinvestigation. Bull. Geol. Surv. S. Afr., 85, 20 pp.

PARTRIDGE, T.C. & SCOTT, L. 2000. Lakes and pans. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp.145 - 161. Oxford University Press, Oxford.

PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Geological Society of South Africa, Marshalltown.

S.A.C.S. (South African Committee for Stratigraphy), 1980. Stratigraphy of South Africa. Part 1. Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia, and the Republics of Bophuthatswana, Transkei, and Venda. Handbook of the Geological Survey of South Africa, 8, 690pp

SCOTT, L, & ROSSOUW, L. 2005 Reassessment of botanical evidence for palaeoenvironments at Florisbad, South Africa. South African Archaeological Bulletin 60: 96-102.

SCOTT, L. & J.S. BRINK. 1992. Quaternary palynology, palaeontology and palaeoenvironments in central South Africa. South African Geographer 19: 22-34.

SCOTT, L. AND KLEIN, R.G. 1981. A hyena-accumulated bone assemblage from Late Holocene deposits at Deelpan, Orange Free State. Annals of the South African Museum 86(6): 217 – 227.

SG 2.2 SAHRA APMHOB Guidelines, 2012. Minimum standards for palaeontological components of Heritage Impact Assessment Reports, Pp 1-15. Society of South Africa, Johannesburg.

TANKARD, A.J., JACKSON, M.P.A., ERIKSSON, K.A., HOBDAY, D.K., HUNTER, D.R. & MINTER, W.E.L. 1982. Crustal evolution of southern Africa – 3.8 billion years of earth history, xv + 523pp. Springer Verlag, New York.

THOMAS, D.S.G. & SHAW, P.A. 1991. The Kalahari environment, 284 pp. Cambridge University Press

THOMAS, M.J. 1981. The geology of the Kalahari in the Northern Cape Province (Areas 2620 and 2720). Unpublished MSc thesis, University of the Orange Free State, Bloemfontein, 138 pp.

THOMAS, D.S.G. & SHAW, P.A. 1991. The Kalahari environment, 284 pp. Cambridge University Press, Cambridge.

TOOTH, S. BRANDT, D., HANCOX P.J. AND MCCARTHY, T. S. 2004. Geological controls on alluvial river behaviour: a comparative study of three rivers in the South African Highveld. Journal of African Earth Sciences, 38(2004): 79-97, 15 Aug.

VAN ZYL, W., S. BADENHORST & J.S. BRINK. 2016. Pleistocene Bovidae from X Cave on Bolt's Farm in the Cradle of Humankind in South Africa. Annals of the Ditsong National Museum of Natural History 6: 39–73.

VISSER, D.J.L. (ed) 1984. Geological Map of South Africa 1:100 000. South African Committee for Stratigraphy, Council for Geoscience, Pretoria.

VISSER, D.J.L. (ed) 1989. Toeligting: Geologiese kaart (1:100 000). Die Geologie van die Republieke van Suid Afrika, Transkei, Bophuthatswana, Venda, Ciskei en die Koningkryke van Lesotho en Swaziland. South African Committee for Stratigraphy. Council for Geoscience, Pretoria, Pp 494.

APPENDIX A: CURRICULUM VITAE

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	30 years in Palaeontology
EDUCATION:	B.Sc Botany and Zoology, 1988 University of the Orange Free State
	B. Sc (Hons) Zoology, 1991 University of the Orange Free State
	Management Course, 1991 University of the Orange Free State
	M. Sc. *Cum laude* (Zoology), 2009 University of the Free State

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

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–2022

TECHNICAL REPORTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Butler, E. 2017. Palaeontological Impact Assessment of the proposed development of the H_2 Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspruit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province. Bloemfontein.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Butler, E. 2018. Palaeontological Field Assessment for the proposed re-alignment and de-commissioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

Butler, E. 2018. Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

Butler, E. 2018. Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province. Bloemfontein.

Butler, E. 2018. Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. Bloemfontein.

Butler, E. 2018. Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. Bloemfontein.

Butler, E. 2018 Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.

Butler, E. 2018. Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.

Butler, E. 2018. Palaeontological Field Assessment of the proposed Megamor Extension, East London. Bloemfontein

Butler, E. 2018. Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division HO, North West Province. Bloemfontein.

Butler, E. 2018. Palaeontological Impact Assessment of the proposed construction of a new 11kV (1.3km) Power Line to supply electricity to a cell tower on farm 215 near Delportshoop in the Northern Cape. Bloemfontein.

Butler, E. 2018. Palaeontological Field Assessment of the proposed construction of a new 22 kV single wood pole structure power line to the proposed MTN tower, near Britstown, Northern Cape Province. Bloemfontein.

Butler, E. 2018. Palaeontological Exemption Letter for the proposed reclamation and reprocessing of the City Deep Dumps in Johannesburg, Gauteng Province. Bloemfontein.

Butler, E. 2018. Palaeontological Exemption letter for the proposed reclamation and reprocessing of the City Deep Dumps and Rooikraal Tailings Facility in Johannesburg, Gauteng Province. Bloemfontein.

Butler, E. 2018. Proposed Kalabasfontein Mine Extension project, near Bethal, Govan Mbeki District Municipality, Mpumalanga. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment of the proposed Mookodi – Mahikeng 400kV Line, North West Province. Bloemfontein.

Butler, E. 2018. Environmental Impact Assessment (EIA) for the Proposed 325mw Rondekop Wind Energy Facility between Matjiesfontein and Sutherland in the Northern Cape Province.

Butler, E. 2018. Palaeontological Impact Assessment of the proposed construction of the Tooverberg Wind Energy Facility, and associated grid connection near Touws River in the Western Cape Province. Bloemfontein.

Butler, E. 2018. Palaeontological impact assessment of the proposed Kalabasfontein Mining Right Application, near Bethal, Mpumalanga.

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Westrand Strengthening Project Phase II.

Butler, E., 2019. Palaeontological Field Assessment for the proposed Sirius 3 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province

Butler, E., 2019. Palaeontological Field Assessment for the proposed Sirius 4 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province

Butler, E., 2019. Palaeontological Field Assessment for Heuningspruit PV 1 Solar Energy Facility near Koppies, Ngwathe Local Municipality, Free State Province.

Butler, E., 2019. Palaeontological Field Assessment for the Moeding Solar Grid Connection, North West Province.

Butler, E., 2019. Recommended Exemption from further Palaeontological studies for the Proposed Agricultural Development on Farms 1763, 2372 And 2363, Kakamas South Settlement, Kai! Garib Municipality, Mgcawu District Municipality, Northern Cape Province.

Butler, E., 2019. Recommended Exemption from further Palaeontological studies: of Proposed Agricultural Development, Plot 1178, Kakamas South Settlement, Kai! Garib Municipality

Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed Waste Rock Dump Project at Tshipi Borwa Mine, near Hotazel, Northern Cape Province:

Butler, E., 2019. Palaeontological Exemption Letter for the proposed DMS Upgrade Project at the Sishen Mine, Gamagara Local Municipality, Northern Cape Province

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Integrated Environmental Authorisation process for the proposed Der Brochen Amendment project, near Groblershoop, Limpopo

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed updated Environmental Management Programme (EMPr) for the Assmang (Pty) Ltd Black Rock Mining Operations, Hotazel, Northern Cape

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Kriel Power Station Lime Plant Upgrade, Mpumalanga Province

Butler, E., 2019. Palaeontological Impact Assessment for the proposed Kangala Extension Project Near Delmas, Mpumalanga Province.

Butler, E., 2019. Palaeontological Desktop Assessment for the proposed construction of an iron/steel smelter at the Botshabelo Industrial area within the Mangaung Metropolitan Municipality, Free State Province.

Butler, E., 2019. Recommended Exemption from further Palaeontological studies for the proposed agricultural development on farms 1763, 2372 and 2363, Kakamas South settlement, Kai! Garib Municipality, Mgcawu District Municipality, Northern Cape Province.

Butler, E., 2019. Recommended Exemption from further Palaeontological Studies for Proposed formalisation of Gamakor and Noodkamp low-cost Housing Development, Keimoes, Gordonia Rd, Kai !Garib Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.

Butler, E., 2019. Recommended Exemption from further Palaeontological Studies for proposed formalisation of Blaauwskop Low-Cost Housing Development, Kenhardt Road, Kai !Garib Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed mining permit application for the removal of diamonds alluvial and diamonds kimberlite near Windsorton on a certain portion of Farm Zoelen's Laagte 158, Registration Division: Barkly Wes, Northern Cape Province.

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Vedanta Housing Development, Pella Mission 39, Khâi-Ma Local Municipality, Namakwa District Municipality, Northern Cape.

Butler, E., 2019. Palaeontological Desktop Assessment for The Proposed 920 KWP Groenheuwel Solar Plant Near Augrabies, Northern Cape Province

Butler, E., 2019. Palaeontological Desktop Assessment for the establishment of a Super Fines Storage Facility at Amandelbult Mine, Near Thabazimbi, Limpopo Province

Butler, E., 2019. Palaeontological Impact Assessment for the proposed Sace Lifex Project, Near Emalahleni, Mpumalanga Province

Butler, E., 2019. Palaeontological Desktop Assessment for the proposed Rehau Fort Jackson Warehouse Extension, East London

Butler, E., 2019. Palaeontological Desktop Assessment for the proposed Environmental Authorisation Amendment for moving 3 Km of the Merensky-Kameni 132KV Powerline

Butler, E., 2019. Palaeontological Impact Assessment for the proposed Umsobomvu Solar PV Energy Facilities, Northern and Eastern Cape

Butler, E., 2019. Palaeontological Desktop Assessment for six proposed Black Mountain Mining Prospecting Right Applications, without Bulk Sampling, in the Northern Cape.

Butler, E., 2019. Palaeontological field Assessment of the Filling Station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng

Butler, E., 2019. Palaeontological Desktop Assessment of The Proposed Upgrade of The Vaal Gamagara Regional Water Supply Scheme: Phase 2 And Groundwater Abstraction

Butler, E., 2019. Palaeontological Desktop Assessment of The Expansion of The Jan Kempdorp Cemetery on Portion 43 Of Farm Guldenskat 36-Hn, Northern Cape Province

Butler, E., 2019. Palaeontological Desktop Assessment of the Proposed Residential Development on Portion 42 Of Farm Geldunskat No 36 In Jan Kempdorp, Phokwane Local Municipality, Northern Cape Province

Butler, E., 2019. Palaeontological Impact Assessment of the proposed new Township Development, Lethabo Park, on Remainder of Farm Roodepan No 70, Erf 17725 And Erf 15089, Roodepan Kimberley, Sol Plaatjies Local Municipality, Frances Baard District Municipality, Northern Cape

Butler, E., 2019. Palaeontological Protocol for Finds for the proposed 16m WH Battery Storage System in Steinkopf, Northern Cape Province

Butler, E., 2019. Palaeontological Exemption Letter of the proposed 4.5WH Battery Storage System near Midway-Pofadder, Northern Cape Province

Butler, E., 2019. Palaeontological Exemption Letter of the proposed 2.5ml Process Water Reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape

Butler, E., 2019. Palaeontological Desktop Assessment for the Establishment of a Super Fines Storage Facility at Gloria Mine, Black Rock Mine Operations, Hotazel, Northern Cape:

Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed New Railway Bridge, and Rail Line Between Hotazel and the Gloria Mine, Northern Cape Province

Butler, E., 2019. Palaeontological Exemption Letter of The Proposed Mixed Use Commercial Development on Portion 17 of Farm Boegoeberg Settlement Number 48, !Kheis Local Municipality in The Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment of the Proposed Diamond Mining Permit Application Near Kimberley, Sol Plaatjies Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment of the Proposed Diamonds (Alluvial, General & In Kimberlite) Prospecting Right Application near Postmasburg, Registration Division; Hay, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed diamonds (alluvial, general & in kimberlite) prospecting right application near Kimberley, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Phase 1 Impact Assessment of the proposed upgrade of the Vaal Gamagara regional water supply scheme: Phase 2 and groundwater abstraction. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed seepage interception drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Phase 1 Assessment for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological field Assessment for the Proposed Upgrade of the Kolomela Mining Operations, Tsantsabane Local Municipality, Siyanda District Municipalitty, Northern Cape Province, Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment of the proposed feldspar prospecting rights and mining application on portion 4 and 5 of the farm Rozynen 104, Kakamas South, Kai! Garib Municipality, Zf Mgcawu District Municipality, Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Phase 1 Field Assessment of the proposed Summerpride Residential Development and Associated Infrastructure on Erf 107, Buffalo City Municipality, East London. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Impact Assessment for the proposed re-commission of the Old Balgay Colliery near Dundee, KwaZulu Natal.

Butler, E., 2019. Palaeontological Phase 1 Impact Assessment for the Proposed Re-Commission of the Old Balgay Colliery near Dundee, KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Impact Assessment and Protocol for Finds of a Proposed New Quarry on Portion 9 (of 6) of the farm Mimosa Glen 885, Bloemfontein, Free State Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Impact Assessment and Protocol for Finds of a proposed development on Portion 9 and 10 of the Farm Mimosa Glen 885, Bloemfontein, Free State Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Exemption Letter for the proposed residential development on the Remainder of Portion 1 of the Farm Strathearn 2154 in the Magisterial District of Bloemfontein, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Field Assessment for the Proposed Nigel Gas Transmission Pipeline Project in the Nigel Area of the Ekurhuleni Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment for five Proposed Black Mountain Mining Prospecting Right Applications, Without Bulk Sampling, in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E. 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and an Integrated Water Use Licence Application for the Reclamation of the Marievale Tailings Storage Facilities, Ekurhuleni Metropolitan Municipality - Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Impact Assessment for the Proposed Sace Lifex Project, near Emalahleni, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment for the proposed Golfview Colliery near Ermelo, Msukaligwa Local Municipality, Mpumalanga Province

Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed Kangra Maquasa Block C Mining development near Piet Retief, in the Mkhondo Local Municipality within the Gert Sibande District Municipality. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed Amendment of the Kusipongo Underground and Opencast Coal Mine in Support of an Environmental Authorization and Waste Management License Application. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2019. Palaeontological Exemption Letter of the Proposed Mamatwan Mine Section 24g Rectification Application, near Hotazel, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Field Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Extension of the South African Nuclear Energy Corporation (Necsa) Pipe Storage Facility, Madibeng Local Municipality, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Field Assessment for the Proposed Piggery on Portion 46 of the Farm Brakkefontien 416, Within the Nelson Mandela Bay Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological field Assessment for the proposed Rietfontein Housing Project as part of the Rapid Land Release Programme, Gauteng Province Department of Human Settlements, City of Johannesburg Metropolitan Municipality. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Choje Wind Farm between Grahamstown and Somerset East, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application for the Prospecting of Diamonds (Alluvial, General & In Kimberlite), Combined with A Waste License Application, Registration Division: Gordonia and Kenhardt, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Impact Assessment for the Proposed Clayville Truck Yard, Ablution Blocks and Wash Bay to be Situated on Portion 55 And 56 Of Erf 1015, Clayville X11, Ekurhuleni Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Hartebeesthoek Residential Development. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Mooiplaats Educational Facility, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Impact Assessment for the Proposed Monument Park Student Housing Establishment. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Field Assessment for the Proposed Standerton X10 Residential and Mixed-Use Developments, Lekwa Local Municipality Standerton, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Field Assessment for the Rezoning and Subdivision of Portion 6 Of Farm 743, East London. Banzai Environmental (Pty) Ltd, Bloemfontein. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Field Assessment for the Proposed Matla Power Station Reverse Osmosis Plant, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application Without Bulk Sampling for the Prospecting of Diamonds Alluvial near Bloemhof on Portion 3 (Portion 1) of the Farm Boschpan 339, the Remaining Extent of Portion 8 (Portion 1), Portion 9 (Portion 1) and Portion 10 (Portion 1) and Portion 17 (Portion 1) of the Farm Panfontein 270, Registration Division: Ho, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application Combined with a Waste Licence Application for the Prospecting of Diamonds Alluvial, Diamonds General and Diamonds near Wolmaransstad on the Remaining Extent, Portion 7 and Portion 8 Of Farm Rooibult 152, Registration Division: HO, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application With Bulk Sampling combined with a Waste Licence Application for the Prospecting of Diamonds Alluvial (Da), Diamonds General (D), Diamonds (Dia) and Diamonds In Kimberlite (Dk) near Prieska On Portion 7, a certain Portion of the Remaining Extent of Portion 9 (Wouter), Portion 11 (De Hoek), Portion 14 (Stofdraai) (Portion of Portion 4), the Remaining Extent of Portion 16 (Portion Of Portion 9) (Wouter) and the Remaining Extent of Portion 18 (Portion of Portion 10) of the Farm Lanyon Vale 376, Registration Division: Hay, Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Area and Mining Permit Area near Ritchie on the Remaining Extent of Portion 3 (Anna's Hoop) of the Farm Zandheuvel 144, Registration Division: Kimberley, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Okapi Diamonds (Pty) Ltd Mining Right of Diamonds Alluvial (Da) & Diamonds General (D) Combined with a Waste Licence Application on the Remaining Extent of Portion 9 (Wouter) of the Farm Lanyon Vale

376; Registration Division: Hay; Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Field Assessment of the Proposed Prospecting Right Application for the Prospecting of Diamonds (Alluvial & General) between Douglas and Prieska on Portion 12, Remaining Extent of Portion 29 (Portion of Portion 13) and Portion 31 (Portion of Portion 29) on the Farm Reads Drift 74, Registration Division; Herbert, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Mining Permit Application Combined with a Waste License Application for the Mining of Diamonds (Alluvial) Near Schweitzer-Reneke on a certain Portion of Portion 12 (Ptn of Ptn 7) of the Farm Doornhoek 165, Registration Division: HO, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for Black Mountain Koa South Prospecting Right Application, Without Bulk Sampling, in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Impact Assessment of the Proposed AA Bakery Expansion, Sedibeng District Municipality, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Boegoeberg Township Expansion,! Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Gariep Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Groblershoop Township Expansion, !Kheis Local Municipality, Zf Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Grootdrink Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Exemption Letter for the Proposed Opwag Township Expansion,! Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Exemption Letter for the Proposed Topline Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Wegdraai Township Expansion, !Kheis Local Municipality, Zf Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

1.1 Butler, E., 2020. Palaeontological field Assessment for the Proposed Establishment of an Emulsion Plant on Erf 1559, Hardustria, Harrismith, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler. 2020. Part 2 Environmental Authorisation (EA) Amendment Process for the Kudusberg Wind Energy Facility (WEF) near Sutherland, Western and Northern Cape Provinces- Palaeontological Impact Assessment. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment Proposed for the Construction and Operation of the Battery Energy Storage System (BESS) and Associated Infrastructure and inclusion of Additional Listed Activities for the Authorised Droogfontein 3 Solar Photovoltaic (PV) Energy Facility Located near Kimberley in the Sol Plaatje Local Municipality, Francis Baard District Municipality, in the Northern Cape Province of South Africa. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Impact Assessment for the Proposed Development of a Cluster of Renewable Energy Facilities between Somerset East and Grahamstown in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the Proposed Amaoti Secondary School, Pinetown, eThekwini Metropolitan Municipality KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Proposed an Inland Diesel Depot, Transportation Pipeline and Associated Infrastructure on Portion 5 of the Farm Franshoek No. 1861, Swinburne, Free State Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed erosion control gabion installation at Alpine Heath Resort on the farm Akkerman No 5679 in the Bergville district Kwazulu-Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed Doornkloof Residential development on portion 712 of the farm Doornkloof 391 Jr, City of Tshwane Metropolitan Municipality in Gauteng, South Africa. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the Proposed Expansion of the Square *Kilometre* Array (SKA) Meerkat Project, on the Farms Mey's Dam RE/68, Brak Puts RE /66, Swartfontein RE /496 & Swartfontein 2/496, in the Kareeberg Local Municipality, Pixley Ka Seme District Municipality, and the Farms Los Berg 1/73 & Groot Paardekloof RE /74, in the Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for De Beers Consolidated Mines: Proposed Drilling on Portion 6 of Scholtzfontein 165 and Farm Arnotsdale 175, Herbert District in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for De Beers Consolidated Mines: Proposed Drilling on the Remaining Extent of Biessie Laagte 96, and Portion 2 and 6 of Aasvogel Pan 141, Near Hopetown in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for De Beers Consolidated Mines: Proposed Drilling in the North West Province: on Portions 7 (RE) (of Portion 3), 11, 12 (of Portion 3), 34 (of Portion 30), 35 (of Portion 7) of the Farm Holfontein 147 IO and Portions 1, 2 and the RE) of the Farm Kareeboschbult 76 Ip and Portions 1, 2, 4, 5, 6, (of Portion 3), 7 (of Portion 3), 13, 14, and the Re of the farm Oppaslaagte 100IP and portions 25 (of Portion 24) and 30 of the farm Slypsteen 102 IP. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the Proposed Expansion of the Cavalier Abattoir on farm Oog Van Boekenhoutskloof of Tweefontein 288 JR, near Cullinan, City of Tshwane Metropolitan Municipality, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Proposed Doornkloof Residential Development on Portion 712 of the Farm Doornkloof 391 JR, City of Tshwane Metropolitan Municipality in Gauteng, South Africa. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed High Density Social Housing Development on part of the Remainder of Portion 171 and part of Portion 306 of the farm Derdepoort 326 JR, City of Tshwane. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Red Rock Mountain Farm activities on Portions 2, 3 and 11 of the Farm Buffelskloof 22, near Calitzdorp in the Western Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Mixed-use Development on a Part of Remainder of Portion 171 and Portion 306 of the farm Derdepoort 326 JR, City of Tshwane. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Proposed Realignment of the D 2809 Provincial Road as well as the Mining Right Application for the Glisa and Paardeplaats Sections of the NBC Colliery (NBC) near Belfast (eMakhazeni), eMakhazeni Local Municipality, Nkangala District Municipality, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed construction of Whittlesea Cemetery within Enoch Mgijima Local Municipality area, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the establishment of a mixed-use development on Portion 0 the of Erf 700, Despatch, Nelson Mandela Bay Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed East Orchards Poultry Farm, Delmas/Botleng Transitional Local Council, Mpumalanga. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed East Orchards Poultry Farm, Delmas/Botleng Transitional Local Council, Mpumalanga. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment to assess the proposed Gariep Road upgrade near Groblershoop, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Ngwedi Solar Plant which forms part of the authorised Paleso Solar Powerplant near Viljoenskroon in the Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Noko Solar Power Plant and power line which forms part of the authorised Paleso Solar Powerplant near Orkney in the North West. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Proposed Power Line as part of the Paleso Solar Power Plant near Viljoenskroon in the Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Thakadu Solar Plant which forms part of the authorised Paleso Solar Powerplant near Viljoenskroon in the Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the proposed Farming Expansions on Portions 50 of the Farm Rooipoort 555 JR, Portion 34 of the Farm Rooipoort 555 JR, Portions 20 and 49 of the Farm Rooipoort 555 JR and Portion 0(RE) of the Farm Oudou Boerdery 626 JR, Tshwane Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the proposed Saselamani CBD on the Remainder of Tshikundu's Location 262 MT, and the Remainder of Portion 1 of Tshikundu's Location 262 MT, Collins Chabane Local Municipality, Limpopo Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed expansions of the existing Molare Piggery infrastructure and related activities on Portion 0(Re) of the farm Arendsfontein 464 JS, Portion 0(Re) of the farm Wanhoop 443 JS, Portion 0(Re) of the farm Eikeboom 476 JS and Portions 2 & 7 of the farm Klipbank 467 JS within the jurisdiction of the

Steve Tshwete Local Municipality, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Nchwaning Rail Balloon Turn Outs at Black Rock Mine Operations (BRMO) near Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Black Rock Mining Operations (BRMO) new rail loop and stacker reclaimer Project at Gloria Mine near Hotazel in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2020. Palaeontological Desktop Assessment for the proposed Nchwaning Rail Balloon Turn Outs at Black Rock Mine Operations (BRMO) near Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed utilization of one Borrow Pit for the planned Clarkebury DR08034 Road Upgrade, Engcobo Local Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Kappies Kareeboom Prospecting Project on Portion 1 and the Remainder of the farm Kappies Kareeboom 540, the Remainder of Farm 544, Portion 5 of farm 534 and Portion 1 of the farm Putsfontein 616, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Lewis Prospecting Project on Portions of the Farms Lewis 535, Spence 537, Wright 538, Symthe 566, Bredenkamp 567, Brooks 568, Beaumont 569 and Murray 570, John Taolo Gaetsewe District Municipality in the Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the Construction of the Ganspan Pering 132kV Powerline, Phokwane Local Municipality, Frances Baard District Municipality in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the Longlands Prospecting Project on a Portion of the farm Longlands 350, Frances Baard District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed development of 177 new units in the northern section of Mpongo Park in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Qhumanco Irrigation Project, Chris Hani District Municipality Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Raphuti Settlement Project on Portions of the Farm Weikrans 539KQ in the Waterberg District Municipality of the Limpopo Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Senqu Rural Project, Joe Gqabi District Municipality, Senqu Local Municipality, in the Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed new Township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the ECDOT Borrow Pits and WULA near Sterkspruit, Joe Gqabi District Municipality in the Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed SANRAL Stone Crescent Embankment Stabilisation Works along the N2 on the farm Zyfer Fonteyn 253 (Portion 0, 11 and 12RE) and Palmiet Rivier 305 (Portion 34, 36) near Grahamstown in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the Klein Rooipoort Trust Citrus Development, in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed Victoria West water augmentation project in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Campbell Sewer, Internal Reticulation, Outfall Sewer Line and Oxidation Ponds, located on ERF 1, Siyancuma Local Municipality in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Development and Upgrades within the Great Fish River Nature Reserve, Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for proposed Parsons Power Park a portion of Erf 1. within the Nelson Mandela Bay Municipality in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the proposed expansion of the farming operations on part of portions 7 and 8 of farm Boerboonkraal 353 in the Greater Tubatse Local Municipality of Sekhukhune District, Limpopo Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment to assess the proposed low-level pedestrian bridge, in Heilbron, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment to assess the proposed township developments in Hertzogville, Malebogo, in Heilbron, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment for the proposed construction of Malangazana Bridge on Farm No.64 Nkwenkwana, Engcobo Local Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment to assess the proposed Construction of Middelburg Integrated Transport Control Centre on Portion 14 of Farm 81 Division of Middelburg, Chris Hani District Municipality in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment for the Witteberge Sand Mine on the remainder of farm Elandskrag Plaas 269 located in the Magisterial District of Laingsburg and Central Karoo District Municipality in the Western Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Impact Assessment (PIA) to assess the proposed Agrizone 2, Dube Trade Port in KwaZulu Natal Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2021. Palaeontological Desktop Assessment assessing the proposed Prospecting Right application without bulk sampling for the prospecting of Chrome ore and platinum group metals on the Remaining Extent of the farm Doornspruit 106, Registration Division: HO; North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the proposed Ennerdale Extension 2 Township Establishment on the Undeveloped Part of Portion 134 of the Farm Roodepoort 302IQ, City of Johannesburg Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the Construction of the ESKOM Mesong 400kV Loop-In Loop-Out Project, Ekurhuleni Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the Proposed Vinci Prospecting Right Application on the Remainder of the Farm Vinci 580, ZF Mgcawu District Municipality, in the Northern Cape Province, Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the proposed Farm 431 Mining Right Application (MRA), near Postmasburg, ZF Mgcawu District Municipality, in the Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Impact Assessment for the Leeuw Braakfontein Colliery Expansion Project (LBC) in the Amajuba District Municipality, KwaZulu-Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the proposed reclamation of the 5L23 TSF in Ekurhuleni, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the Proposed Mogalakwena Mine Infrastructure Expansion (near Mokopane in the Mogalakwena Local Municipality, Limpopo Province). Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment for the proposed 10km Cuprum to Kronos Double Circuit 132kV Line and Associated Infrastructure in Copperton in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Impact Assessment for the proposed Hoekplaas WEF near Victoria West in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment (PDA) assessing the proposed Prospecting Right Application without bulk sampling for the Prospecting of Diamonds Alluvial (DA), Diamonds General (D), Diamonds in Kimberlite (DK) & Diamonds (DIA) on the Remaining Extent of the Farm Goede Hoop 547, Remaining Extent of the Farm 548, Remaining Extent of Portion 2 and Portion 3 of the Farm Skeyfontein 536, Registration Division: Hay, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Impact Assessment for the proposed extension of Duine Weg Road between Pellsrus and Marina Martinique as well as a Water Use Authorisation (WUA) for the project. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Proposed Mimosa Residential Development and Associated Infrastructure on Fairview Erven, in Gqeberha (Port Elizabeth), Nelson Mandela Bay Metropolitan Municipality, Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Impact Assessment for the Witteberge Sand Mine on the remainder of farm Elandskrag Plaas 269 located in the Magisterial District of Laingsburg and Central Karoo District Municipality in the Western Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler, E., 2022. Palaeontological Desktop Assessment to assess the Palaeontology for the Somkhele Anthracite Mine's Prospecting Right Application, on the Remainder of the Farm Reserve no 3 No 15822 within the uMkhanyakude District Municipality and the Mtubatuba Local Municipality, KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.

Butler. E. 2022. Palaeontological Desktop Assessment to assess the proposed Altina 120 MW Solar Photovoltaic (PV) Project near Orkney in the Free State,

Butler. E. 2022. Palaeontological Desktop Assessment to assess the proposed SERE Solar Photovoltaic Plant Phase 1A and associated infrastructure in the Western Cape Province.

Butler. E. 2022. Palaeontological Impact Assessment for the proposed development of a 10 MW Solar Photovoltaic (PV) Plant and associated grid connection infrastructure on Portion 9 of the Farm Little Chelsea 10, Eastern Cape Province.

Butler. E. 2022. Palaeontological Desktop Assessment to assess the proposed Dominion 1 Solar Park, located on the Remaining Extent of Portion 18 of Farm 425, near Klerksdorp within the North-West Province.

Butler. E., 2022. Palaeontological Desktop Assessment to assess the proposed Dominion 2 Solar Park, located on the Remaining Extent of Portion 8 of Farm 425, near Klerksdorp within the North-West Province.

Butler. E., 2022.Palaeontological Desktop Assessment to assess the proposed Dominion 3 Solar Park, located on the Remaining Extent of Portion 11 of Farm 425, and Remaining Extent of Portion 31 of Farm 425 near Klerksdorp within the North-West Province

Butler. E., 2022. Palaeontological Impact Assessment to assess the Delta Solar Power Plant on the remaining extent of the farm Kareefontein No. 340, Dr Ruth Segomotsi Mompati District Municipality, Lekwa-Teemane Local Municipality near Bloemhof in the North West Province

Butler. E., 2022. Palaeontological Impact Assessment to assess the Sonneblom Solar Power Plant (SPP) on Portion 1 of the farm Blydschap No. 504 within the Mangaung Metropolitan Municipality, southeast of Bloemfontein in the Free State.

Butler. E., 2022. Palaeontological Impact Assessment for the proposed Naos Solar PV One Project near Viljoenskroon in the Free State.

Butler. E., 2022.Palaeontological Impact Assessment for the proposed Naos Solar PV Two Project near Viljoenskroon in the Free State.

Butler. E., 2022.Palaeontological Impact Assessment for the proposed Naos Solar PV Two Project near Viljoenskroon in the Free State

Butler. E., 2022.Palaeontological Impact Assessment for the Ngwedi Solar Power near Viljoenskroon in the Free State.

Butler. E., 2022. Palaeontological Impact Assessment for the Noko Solar Power Plant and power line near Orkney in the North West.

Butler. E., 2022. Palaeontological Impact Assessment for the Proposed Power Line as part of the Paleso Solar Power Plant near Viljoenskroon in the Free State

Butler. E., 2022. Palaeontological Impact Assessment for the Thakadu Solar Plant which near Viljoenskroon in the Free State

Butler. E., 2022. Palaeontological Impact Assessment of the Kentani, Braklaagte, Klipfontein, Klipfontein 2, Leliehoek and Sonoblomo PV Facilities located near Dealsville in the Free State Province

Butler. E., 2022. Palaeontological Impact Assessment for the proposed Harvard 1 Solar Photovoltaic (PV) facility on Portion 5 of Farm Spes Bona no 2355, Mangaung Metropolitan Municipality in the Free State.

Butler. E., 2022. Palaeontological Impact Assessment for proposed Harvard 2 Solar Photovoltaic (PV) facility on Portion 8 of Farm Spes Bona No 2355, Mangaung Metropolitan Municipality in the Free State.

Butler. E., 2022. Palaeontological Impact Assessment for the proposed Doornrivier Solar 1, southwest of Matjhabeng (formerly Virginia) in the Free State

Butler. E., 2022. Palaeontological Desktop Assessment for the proposed Leeuwbosch PV solar photovoltaic (PV) plant and associated infrastructure on Portion 37 of the Farm Leeuwbosch No. 44 near Leeudoringstad within the Maquassi Hills Local Municipality in the Dr Kenneth Kaunda District Municipality in the North West Province.

Butler. E., 2023. Palaeontological Impact Assessment to assess the Carmel Solar 1 Photovoltaic Solar Energy Facility, near Carletonville, Gauteng Province.

Butler. E., 2023. Palaeontological Impact Assessment to assess the Carmel Solar 2 Photovoltaic Solar Energy Facility, near Carletonville, Gauteng Province

Butler. E., 2023. Palaeontological Impact Assessment to assess the Carmel Solar 3 Photovoltaic Solar Energy Facility, near Carletonville, Gauteng Province.

Butler. E., 2023. Palaeontological Desktop Assessment for the proposed Droogfontein 6 Solar Energy Facility and Battery Energy Storage System, near Kimberley, Northern Cape Province

Butler. E., 2023. Palaeontological Desktop Assessment to assess the Icarus Solar Power Plant near Klerksdorp, North West Province.

Butler. E., 2023. Palaeontological Desktop Assessment to assess the proposed Virgo Solar Power Plant near Kathu in the Northern Cape Province

Butler. E., 2023. Palaeontological Desktop Assessment to assess the proposed Libra Solar Power Plant near Kathu in the Northern Cape Province

Butler. E., 2023. Palaeontological Impact Assessment to assess the proposed Khwezi Solar Grid Infrastructure near Excelsior, in the Free State Province

Butler. E., 2023. Palaeontological Impact Assessment to assess the proposed Khwezi Solar Power Plant near Excelsior, in the Free State Province

Butler. E., 2023. Palaeontological Impact Assessment to assess the proposed Lengana Solar Grid Infrastructure near Excelsior, in the Free State Province

Butler. E., 2023. Palaeontological Impact Assessment to assess the proposed Lengana Solar Power Plant near Excelsior, in the Free State Province

Butler. E., 2023. Palaeontological Desktop Assessment for Luckhoff Solar 1 Photovoltaic Solar Energy Facility (SEF) and associated infrastructure near Luckhoff in the Free State