



PHASE 1 HIA PROSPECTING RIGHTS N'CHAWANING NO.
267 HOTAZEL NORTHERN CAPE

APPLICATION FOR THE PROPOSED PROSPECTING RIGHTS ON THE REMAINING
EXTENT OF THE FARM N'CHWANING NO. 267, KURUMAN, JOE MOROLONG LOCAL
MUNICIPALITY, JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY,
NORTHERN CAPE PROVINCE

PREPARED FOR:
PSR CIVIL CONSTRUCTION CC

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03 OCTOBER 2022

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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:

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

UBIQUE Heritage Consultants

Date: 2022-10-03

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SUMMARY OF SPECIALIST EXPERTISE

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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 Tshwane University of Technology, a BA Culture and Arts Historical Studies degree (2012) from UNISA and received her BA (Hons) 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 twelve years.

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 Phase1 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 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.

EXECUTIVE SUMMARY

Project description

UBIQUE Heritage Consultants were appointed by PSR Civil Construction 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 prospecting rights application on, the Remaining Extent of the Farm N'chwaning No. 267, Kuruman, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province, on any sites, features, or objects of cultural heritage significance.

Findings and Impact on Heritage Resources

No highly significant heritage resources were identified within or around the development footprint that the proposed prospecting would negatively impact. However, low to medium significant MSA knapping debris with flakes, cores and scrapers of BIF and CCS raw materials were documented along the Ga-Mogara River (NCHW001 & NCHW002). In addition, even though the material found appears isolated and without archaeological context, the desktop study has shown that multiple small sites have been recorded on the banks of the Ga-Mogara River by previous AIA/HIA studies. The isolated sites thus form a part of the broader landscape of human settlement in the area, and this context may prove to be of scientific, historical and cultural significance. We, therefore, consider the banks of the Ga-Mogara River as significant and should be avoided.

The proposed development is underlain by superficial Quaternary deposits of the Gordonia Formation (Kalahari Group). According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Gordonia Formation is Moderate (Almond and Pether 2008, SAHRIS website). Therefore, a Low Palaeontological Significance has been allocated to the proposed development. The project's construction may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage (Butler 2022 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. No highly significant heritage sites or features were identified within the surveyed sections of the development footprint. However, the occurrences of lithic material found along the Ga-Mogara River are considered medium significance in the broader

landscape. Therefore, we recommend that the banks of the Ga-Mogara River be considered significant and that a buffer zone of 100-120m be implemented from the centre of the river to protect any archaeological context these finds may have. No other mitigation is required.

2. A Low Palaeontological Significance has been allocated to the proposed development. Therefore the project's continuation may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage. However, 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 a palaeontologist can carry out that mitigation. Consequently, no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. (Butler 2022).

3. 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 excavation, 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 prove to be 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 the proposed prospecting rights application on the Remaining Extent of the Farm N'chwaning No. 267, Kuruman, Joe Morolong Local Municipality, John Taolo Gaetsewe 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 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 the evaluation of any site is done 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 contacted for an assessment of the find. Observed or located heritage features and/or objects may not be disturbed or removed 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 administered by a local authority. Graves in the category located inside a formal cemetery administered 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 26th – 28th of November 2022 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).

FIELD RATINGS & GRADINGS	
General Protection Grade IVA	The site/resource should be mitigated before destruction (high/ medium significance).
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: <ul style="list-style-type: none"> 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, and guidelines of the Association of South African Professional Archaeologists (ASAPA). 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 PSR Civil Construction 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 prospecting mining rights application on Remaining Extent of the Farm N'chwaning No. 267, Kuruman, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province

The project involves the prospecting of iron ore and manganese.

4.1 Technical information

PROJECT DESCRIPTION	
Project name	Phase 1 HIA Prospecting Rights N'chwaning No. 267 Hotazel Northern Cape
Description	Application for the Proposed Prospecting Rights on the Remaining Extent of the Farm N'chwaning 267, Kuruman, Ga-Segonyana Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province
DEVELOPER	
PSR Civil Construction cc	
Development type	Residential
LANDOWNER	
CONSULTANTS	
Environmental	
Heritage and archaeological	UBIQUE Heritage Consultants
Palaeontological	Banzai Environmental
PROPERTY DETAILS	
Province	Northern Cape
District municipality	John Taolo Gaetsewe District Municipality
Local municipality	Joe Morolong Local Municipality
Topo-cadastral map	1:50 000 2722BB
Farm name	Remaining Extent of the Farm N'chwaning No. 267
Closest town	Hotazel
GPS Co-ordinates	27° 9'8.60"S

	22°55'18.99"E
PROPERTY SIZE	724, 7233 ha
DEVELOPMENT FOOTPRINT SIZE	724, 7233 ha
LAND USE	
Previous	Agriculture
Current	Agriculture
Rezoning required	Yes
Sub-division of land	No
DEVELOPMENT CRITERIA IN TERMS OF SECTION 38(1) NHRA	
Construction of a road, wall, power line, pipeline, canal or other linear forms of development or barrier exceeding 300m in length.	No
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.	Yes
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 .	Yes
Any other development category, public open space, squares, parks, recreation grounds.	No

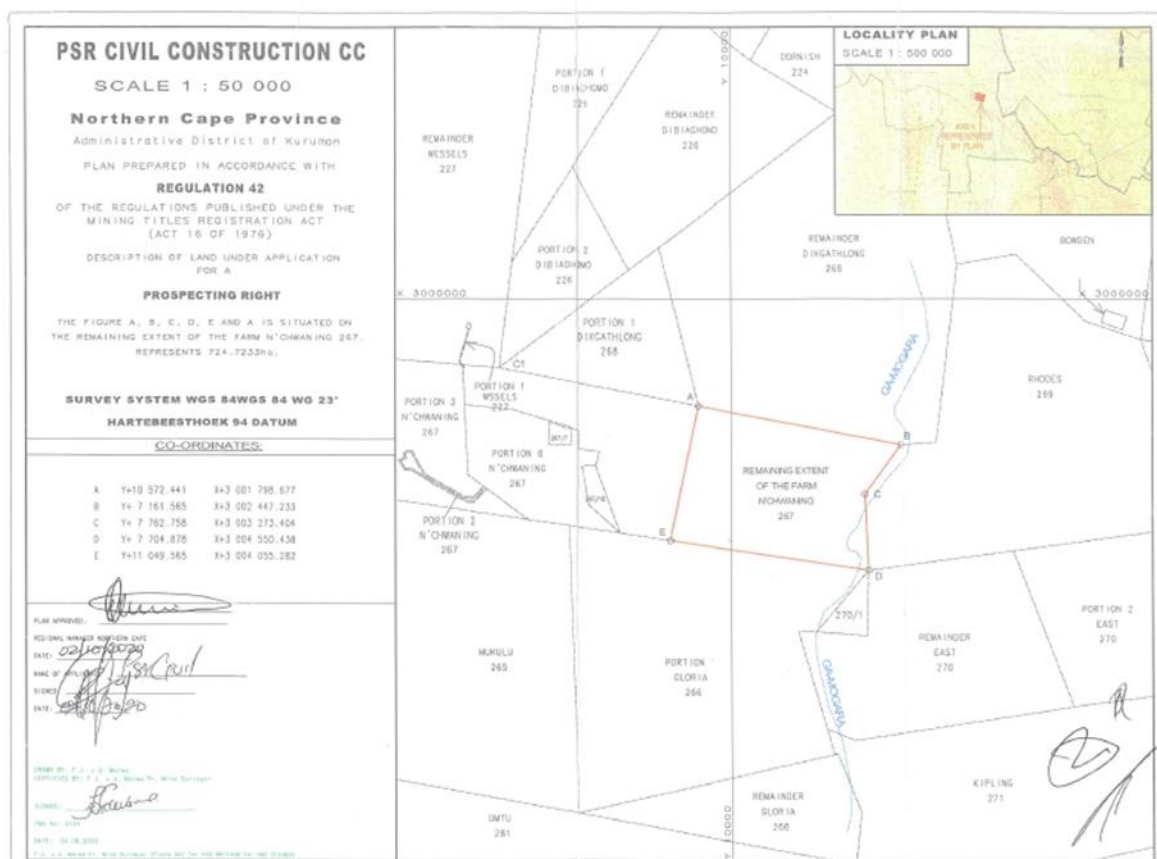


Figure 1 Prospecting right Remaining Extent of the Farm N'chwaning 267, Kuruman, Ga-Segonyana Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province. Image: PSR Civil Construction cc

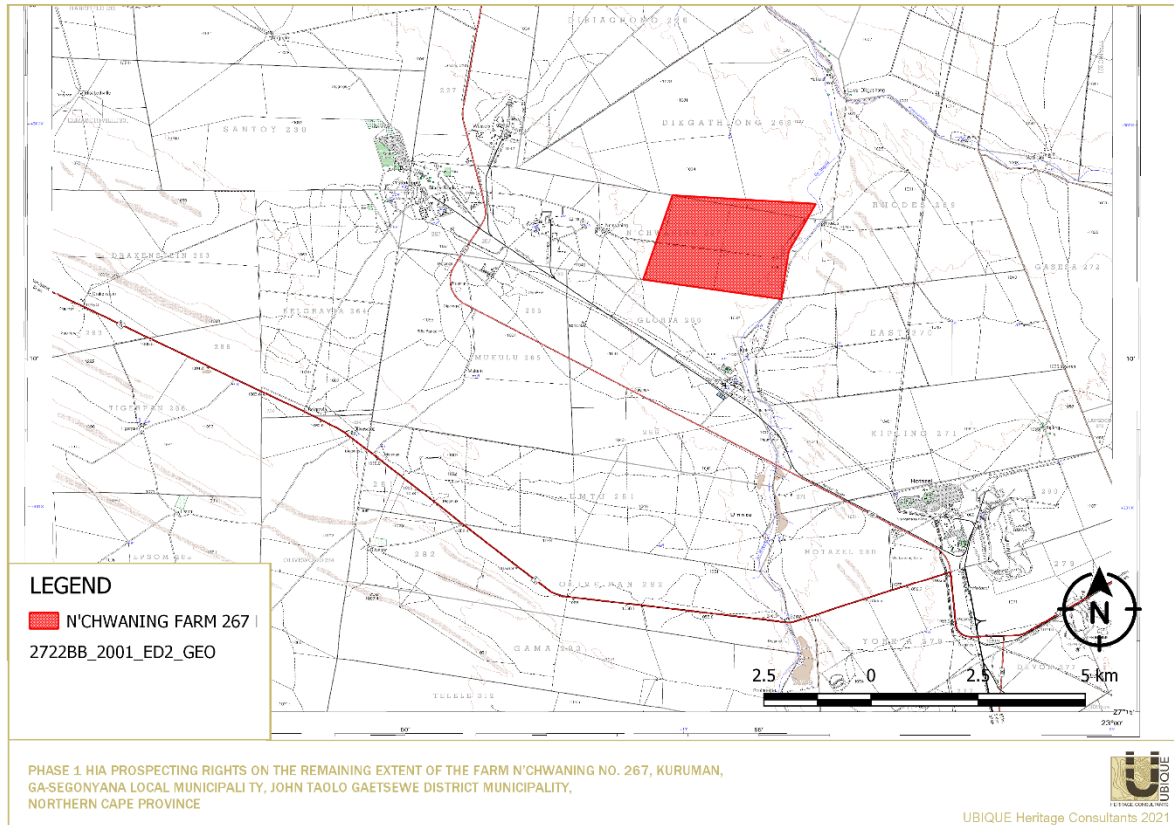


Figure 2 Locality of the development footprint, indicated on 1: 50 000 2722BB map.

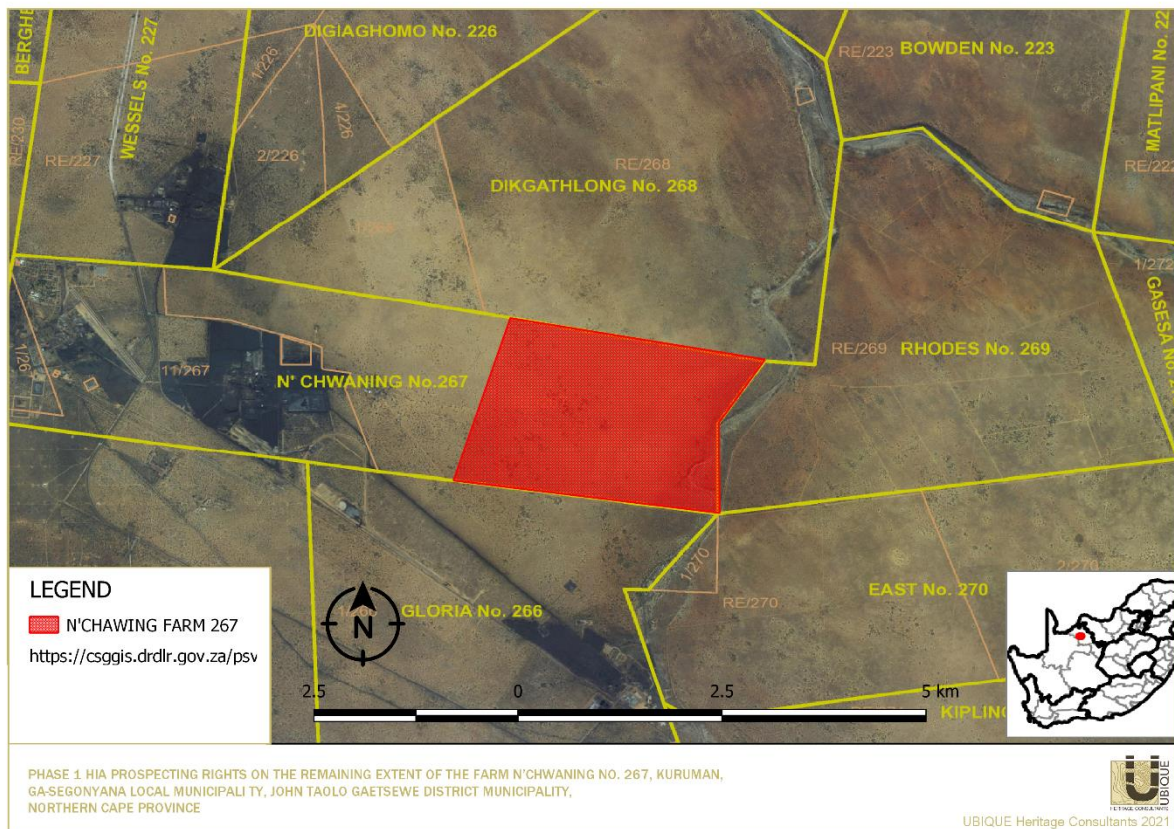


Figure 3 Locality of the development footprint, indicated on chief-surveyor general ARCGIS map (<https://csggis.drdlr.gov.za/psv/>)

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. These sites yield some of the richest Stone Age scatters (Beaumont & Morris 1990; Kruger 2018; Lombard et al. 2012; Morris & Beaumont 2004). Numerous sites have been identified and documented across the region. These sites have been dated to the Earlier, Middle and Later Stone Ages (Kruger 2018).

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 a group of industries where the assemblages share attributes or common traditions (Lombard et al. 2012). The ESA is characterised by flakes produced from pebbles, cobbles and percussive tools, as well as 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 in 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. It would appear to have been a favoured raw material for making stone tools due to its superior flaking qualities (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 till (Morris 2013a, b, c, d, e, & f). Morris (2013b & c) states that substantial MSA sites are relatively uncommon in Bushmanland. However, several sites have been recorded but yield small samples.

Although the Northern Cape region seems sparsely populated by humans in the past (Kruger 2015a), 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). In addition, 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 be found close to local sources of highly-prized raw materials such as banded iron formations (BIF), jaspilite and specularite (Morris 2012; 2018).

Some of the most significant sites of the South African Stone Age are located in the region, including Kathu Pan, Bestwood, Kathu Townlands, and the Wonderwerk Cave. In 1974 (Beaumont 1990), Kathu Pan was discovered when early Stone Age artefacts and the remains of now-extinct animals were observed in the exposed profiles of a sinkhole at Kathu Pan 1 (Beaumont 1990, Nilssen 2018, Orton 2020). The landscape around the town of Kathu is rich in archaeological material and sites. Numerous sites have been excavated, revealing that the area contained a long sequence of Stone Age occupations (ESA, MSA and LSA). Some of the excavations were done on Farm Sims 462 (Kathu Pan 6, 8, 9, 10, 11), Kathu 465 (Kathu Pan 7), Uitkoms 463 (Reserve 2) and at the Kathu Townlands during the 1980s-1990. According to Beaumont (2006), various artefacts were found dating from the Howiesons Poort, “Late Pietersburg”, Wilton and Oakhurst, Fauresmith and Acheulean, as well as an LSA ceramic that included coarse segment (Kathu Pan 11) (Beaumont 2006). The availability of a constant water supply at Kathu Pan is most likely responsible for the long sequence of occupations of the site and the quantity of Stone Age debris (Kruger 2012). The pan covers roughly 0.3 km and is a shallow depression with internal drainage and a high water table. The majority are filled-in sinkholes formed within the calcretes of the Tertiary-aged Kalahari Group. As a result, Kathu Pan 1 has an extensive lithostratigraphic and archaeological sequence (Magoma 2013).

One of the reasons why the Kathu archaeological site complex is important is that recent research on the Stone Age implements from Kathu Pan was dated to 500 000 years ago. This suggests that early humans, possibly the *Homo heidelbergensis*, were hafting multicomponent implements about 200 000 years earlier than previously thought (Wilkins et al. 2012).

Kathu Townlands was first documented in 1980. The initial excavations occurred in 1982 and 1990 (Beaumont 1990; Orton 2020). The southeastern part of the Kathu Townlands site was subjected to rigorous investigation during the Rooisands Mall project, revealing that deposits up to a metre deep are rich in artefacts (e.g. bifaces and debitage) and material consistent with its interpretation as a quarry site (Morris 2014). According to Morris (2014), the pedestrian survey and test pits at Uitkoms 1 revealed similar lithic densities and debitage found at Kathu Townlands 1.

The Bestwood sand quarries have a lithic industry of well-made handaxes, retouched scrapers, occasional blades, and a great diversity of core types, including choppers, polyhedrons, discoidal cores and unidirectional Levallois cores (Morris 2014). Scatters of ESA and MSA stone tools, cores and flakes were recorded at Farm Bestwood 459 (Dreyer 2008c; Van Schalkwyk 2010c). Beaumont (2013) reported on ESA waste flakes and irregular flakes, blades, blade cores, handaxe fragments, handaxe roughouts, and handaxes from the excavations undertaken at Bestwood 549 on the eastern outskirts of Kathu. Test excavations and auger tests were undertaken for the Kathu cemetery by Fourie et al. (2018) (Lylyveld 545, on the southern side of the town of Kathu), yielded MSA material such as flaking debris, complete flakes, cores and formal tools. A single side scraper was recorded on Lylyveld north by Birkholtz (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 made use of ceramics and beads, and smelted iron for weapons and manufactured tools (Hall 1987). Iron Age people were often mixed farmers/agropastoralists. These agropastoralists generally chose to live 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, of course), consisting of features such as houses, raised grain bins, storage pits, and animal kraals/byres. This contrasts with the temporary camps of pastoralists and hunter-gatherers (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.

The expansion of early farmers/agropastoralists occurred in this region between 400 AD and 1100 AD. These early farmers settled in semi-permanent settlements (De Jong 2010). According to De Jong (2010), there is evidence that the EIA continued in the Lowveld until the 15th century. However, it ended by 1100 AD on the escarpment. The Highveld became active again from the 15th century onwards, considering 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, the descendants of the LIA mixed farming communities, 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 finds 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 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). Furthermore, LIA people had briefly utilised the area close to the Orange River, as they had mined copper in the Northern Cape (Van Vollenhoven 2014).

A site of interesting significance is Tswalu Kalahari Reserve. The North of Kuruman Project is an interdisciplinary research project directed by Dr Jayne Wilkins and Dr Benjamin Schoville in close collaboration with Dr Robyn Pickering of the University of Cape Town. The archaeological footprint at Tswalu consists of stone tool scatters, rock art sites, and Iron Age stonewalling (Tswalu n.d.). Previous reconnaissance on and beyond Tswalu has revealed several LSA, MSA, EMSA and ESA lithic occurrences (Beaumont & Bednarik (2015). In addition, the human traces on the terrain attest to the lengthy history of humans in Africa (Tswalu n.d.).

5.1.3 Historical period

Until the onset of European exploration and eventual settlement at modern-day Cape Town during the 17th century (e.g., Giliomee & Mbenga 2007), the Northern Cape region was occupied by Khoisan communities (e.g., Barnard 1992; Beaumont et al. 1995; Parsons 2008), reflected by the material culture discussed in the preceding paragraphs.

The historical era of the Northern Cape is best described as an assortment of events that had a socio-political and socio-economic impact on the indigenous and settler communities. These included client-labour relationships, inter-marriages, political alliances, slavery, trading, criminality, skirmishes, raids, competition for scarce resources such as grazing pasture and water, and ultimately frontier warfare between all groups. Conflict and who fought with whom depended on fluctuating political alliances and socio-political agendas (Anderson 1985; Penn 1995; Parkington et al. 2019).

During the colonial frontier period, place names became fixed on maps and farm names, specifically in a cadastral sense. As a result, numerous names have Khoekhoegowab origin and, as Morris (2017a and b) states, encapsulate vestiges of pre-colonial/indigenous social geography. Interestingly, Morris (2017a and b) also states that genocide against indigenous people is documented in the wider area.

The development of a rich colonial frontier can be seen in the archaeological record (Kruger 2018). However, it was not until relatively recently (because of its distance from the Cape Colony) that this arid part of South Africa's interior was colonised. 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 19th- 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 even 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.

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). Most farms were still government property 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, including 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 volatility and sociocultural stress and transformation in the region (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 southern Africa (De Jong 2010). This period was prompted by the incursion of displaced refugees associated with the Fokeng, Tlokwa, Hlakwa 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 conflicted with Tswana and missionary groups near Bechuanaland and Griqualand West (Van Vollenhoven 2014). A series of wars 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 of the Gariep/Orange River in 1680. These tribes became known as the Korannas, living as small tribal entities in separate areas (Penn 2005).

Several interesting 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 2006a; Beaumont 2007) and fired rifle cartridge shells (Dreyer 2014; Beaumont 2007); and numerous man-moved and stacked boulders (possibly representative of Boer positions during the Siege of Kimberly (Beaumont 2007).

5.2 Local: Hotazel/Kuruman



Figure 4 Military map from the turn of the 19th-20th century of the broad study area.
Image: <https://digitalcollections.lib.uct.ac.za/>

The town of Hotazel is situated approximately southwest of the current development area and northwest of Kuruman. Anecdotal evidence states that a team of land surveyors who stayed in the area in 1915 deemed the place “hot as hell”, referring to the hot weather they experienced during their farm survey. Two versions of what happened the night they had decided on the town’s name. One states that the surveyors had decided on the name (Hotazel) over “a glass of Cape Smoke Brandy” (KS-Hotazel 2021), while another version suggests that they had a “raucous party out in the dunes one night” (SA-Hotazel 2021). Nevertheless, the farm was established and named Hotazel. It is believed that Hotazel was initially founded after a water diviner (seeking an underground stream) found a manganese-bearing black rock, and a mining company eventually bought the farm. Sometime in the 1950s, Hotazel was registered as a town. To date, manganese mining continues in the area (SA-Hotazel 2021).



6. HERITAGE SENSITIVITY

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

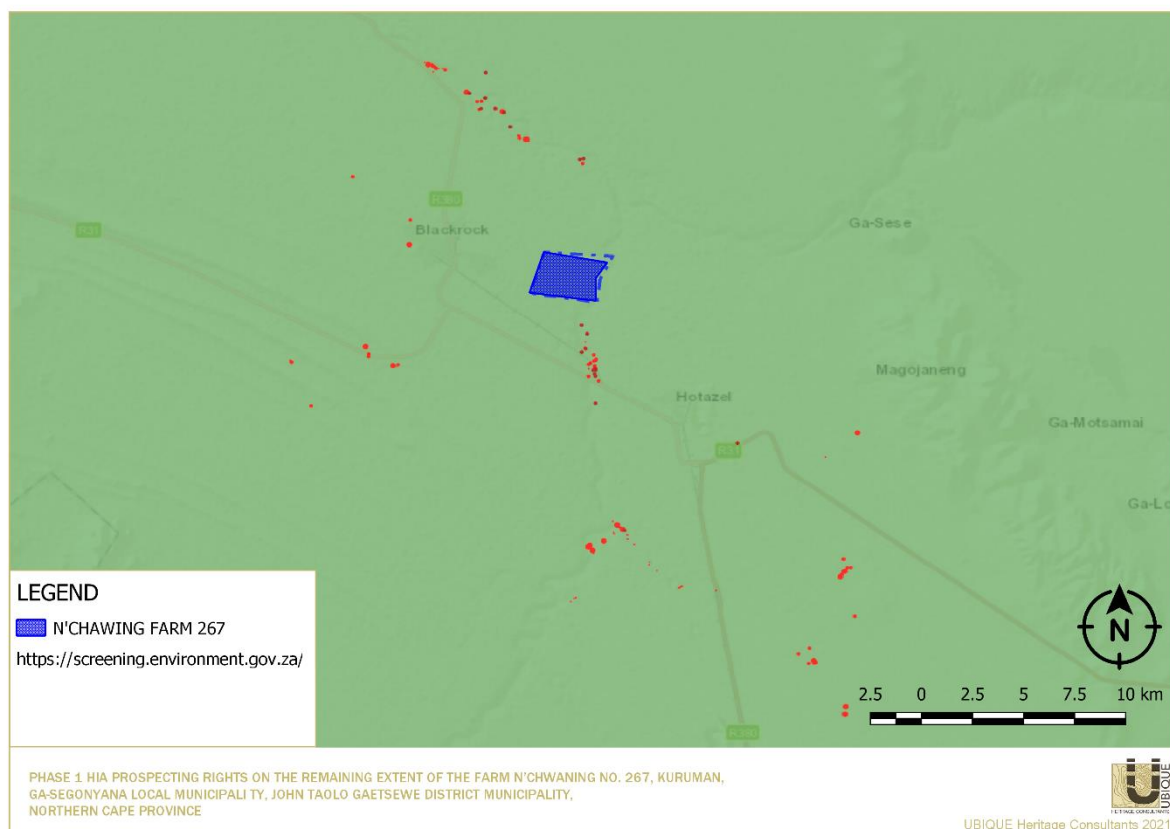


Figure 5 The Project area indicated on the Heritage Screening tool (<https://screening.environment.gov.za/>)

6.1 Summary of Local Heritage Resources: N'Chawing 267 and its surrounds

The desktop study revealed that Impact Assessments had been completed in much of the area. Furthermore, numerous studies were completed in the wider landscape (in a 50 km radius) at and around Kathu and Kuruman. Close to the study area, the assessments predominantly reported on cultural material and features relating to the Middle and Late Stone Ages, and the Historical/Colonial era, which appear to be consistent with the history of the Northern Cape. Several studies encountered very little and/or no archaeological materials/remains (e.g. Birkholtz 2019; Coetzee & George 2013; De Jong 2008; Dreyer 2008d, 2014a; Fourie 2013; Fourie 2014; Fourie & Van der Walt 2006; Kaplan 2010; Kusel 2018; Kruger 2015a; Pistorius 2008; Rossouw

2015; Van Ryneveld 2010; Van Schalkwyk 2010b; 2015; Van Vollenhoven 2016; Van Vollenhoven 2019c; Webley & Halkett 2010).

Fourie & Van der Walt (2006) noted that archaeologically sensitive areas occur near dry riverbeds, such as the Ga-Mogara river. The exposed limestone and pebble deposits often contain lithic material. The riverbanks were sought after for encampments and settlements. This is confirmed by many reports in the area documenting lithic and colonial material closer to water sources than studies completed further away. This can be attributed to the area's harsh climate and can be correlated by the Heritage Screening tool (Figure 5) that shows the high to significant medium sites clustered along the rivers and riverine.



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.

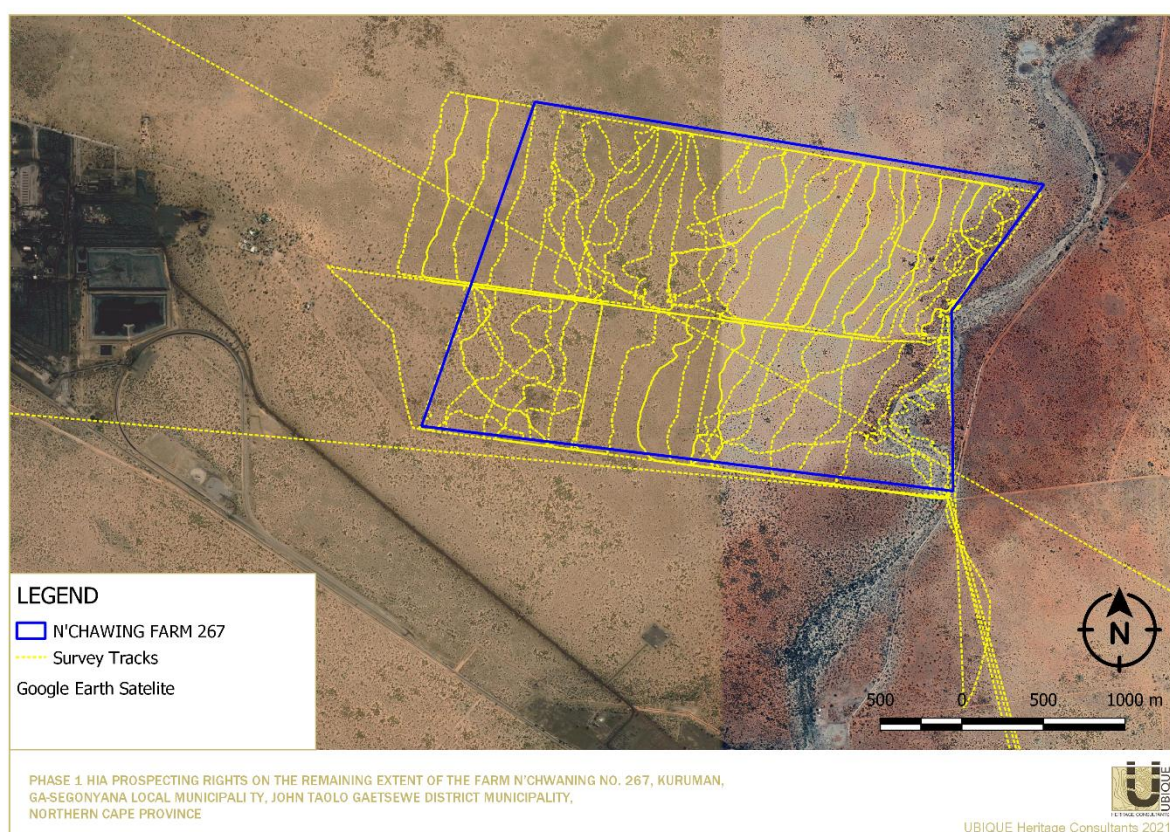


Figure 6 Survey tracks across the development footprint.

7.2 Description of the affected environment

The development area falls mainly within the Kathu Bushveld in the west and Gordonia Duneveld in the east. This gives the vegetation type the appearance of a semidesert steppe. The vegetation types comprise a medium-tall tree layer with *Acacia erioloba* in places, but mostly open and including *Boscia albitrunca* as the prominent trees in the west, and parallel dunes about 3–8 m above the plains to the east. The eastern landscape is also characterised by open shrubland with grassland ridges dominated by *Stipagrostis amabilis* on the dune crests and *Acacia haematoxylon*

on the dune slopes, with *A. mellifera* on lower slopes and *Rhigozum trichotomum* in the interdune *straaten* (SANBI 2022; Mucina & Rutherford 2006).

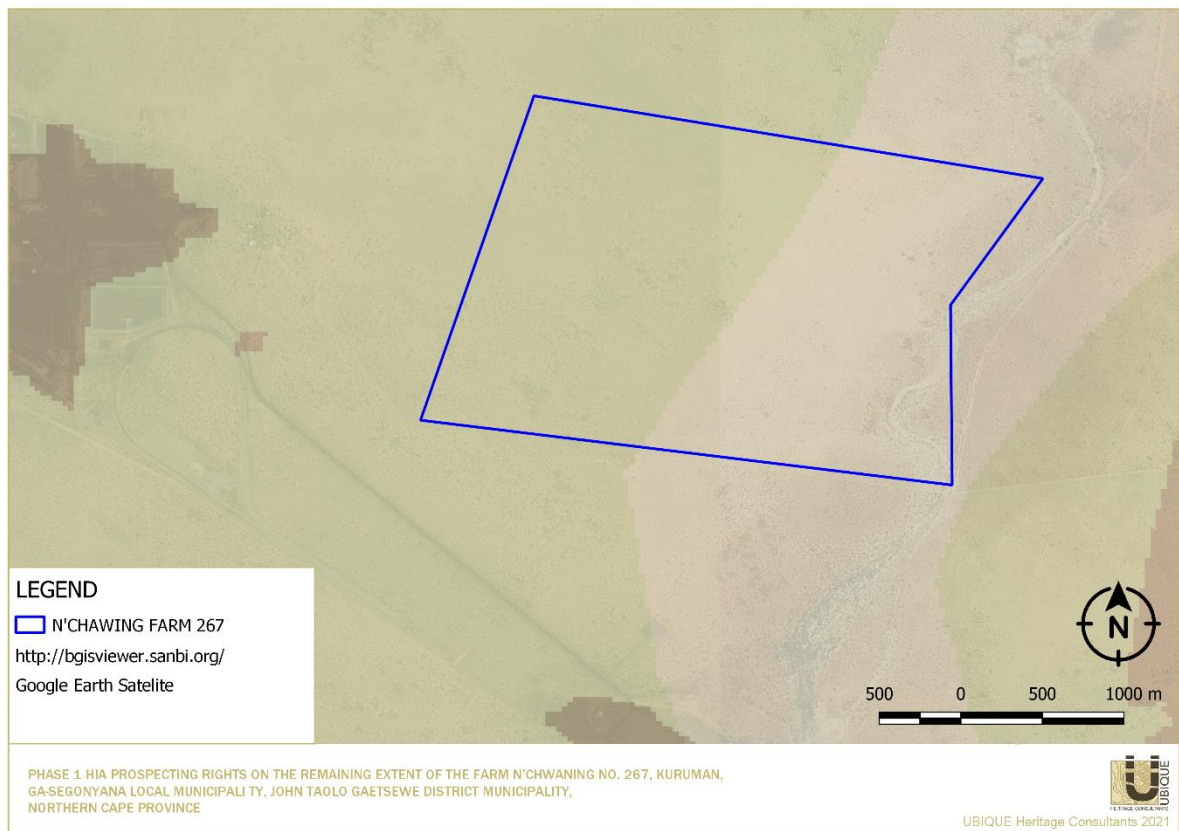


Figure 7 Indication of the vegetation types in and around the study area (Kathu Bushveld in the west and Gordonia Duneveld in the east).

The study terrain is typified by flat sandy plains, with calcrete and dolomite outcrops along the shores of the Ga-Mogara River bed. The site has a gentle slope eastwards towards the river. The site has been predominantly used for livestock agriculture and disturbed by grazing, fenced camps and animal paths. A small borrow pit with associated disturbances can be found towards the southeast of the development footprint.





Figure 8 Views of the affected development area.

7.3 Identified heritage resources

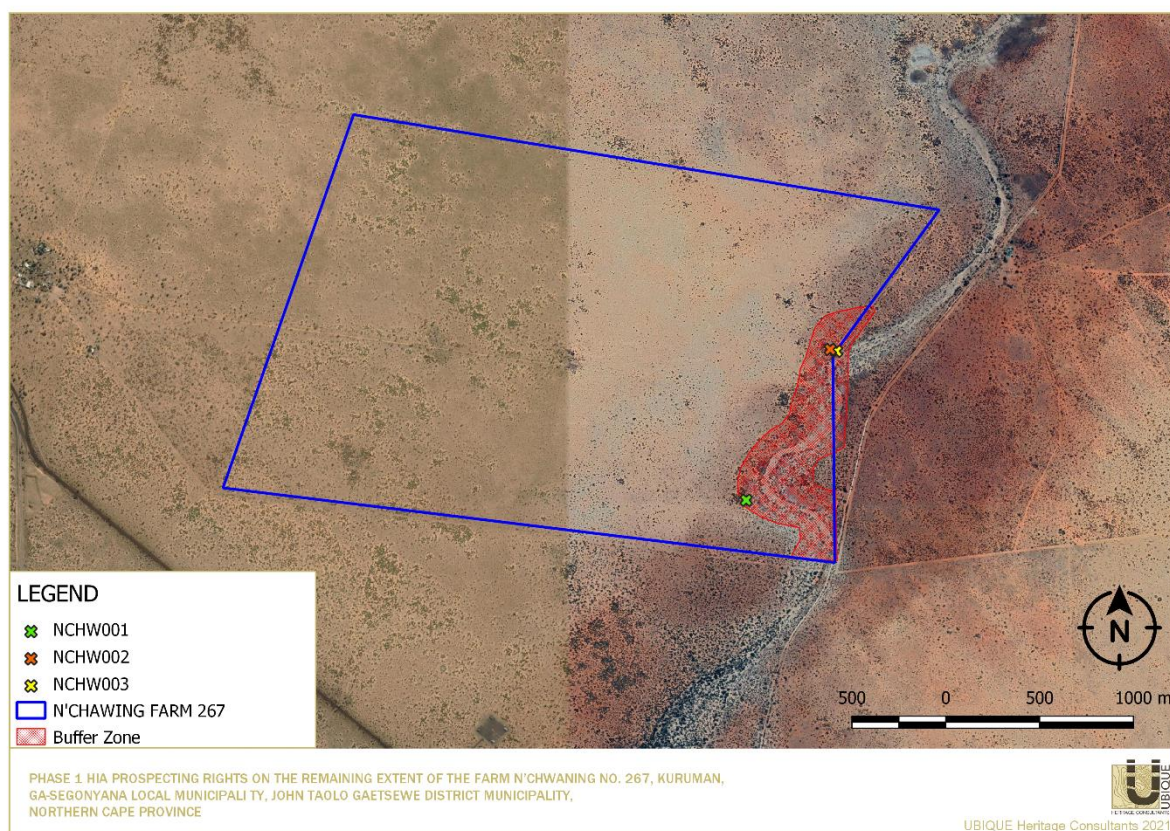


Figure 9 Recorded heritage resources

7.3.1. Stone Age Identified

STONE AGE RESOURCES IDENTIFIED					
SITE ID #	DESCRIPTION		PERIOD	LOCATION	FIELD RATING/ SIGNIFICANCE/ RECOMMENDED MITIGATION
NCHW001	Type lithic/s	Isolated flake and point	MSA	27° 8'54.96"S 22°55'2.96"E	Field Rating IV C (NCW)
	Raw material	BIF			Low significance
	N in m².	2/50m²			No Mitigation Required
	Context	Surface scatter without archaeological context			
	Additional	Possibly alluvilal deposit			
NCHW002	Type lithic/s	Chips, flakes and chunks	MSA	27° 8'25.80"S 22°55'19.23"E	Local Grade IIIB
	Raw material	BIF, CCS			Med significance
	N in m².	16/100m²			Mitigation: Buffer zone along the river bed
	Context	Temporary settlement			
	Additional	Within alluvial pebble deposit			

7.3.2. Historical/Recent resources Identified

HISTORICAL/RECENT RESOURCES IDENTIFIED					
SITE ID #	DESCRIPTION		PERIOD	LOCATION	FIELD RATING/ SIGNIFICANCE/ RECOMMENDED MITIGATION
NCHW003	Type of feature	Cast-iron potsherds	Late-19th century <	27° 8'26.15"S 22° 55'20.43"E	Field Rating IV C (NCW)
	Material	Cast iron			Low significance
	N in m².	3/100m²			No Mitigation Required
	Context	No context. Random surface find			
	Additional				

7.3.3. Graves Identified

No graves were recorded within the development footprint.

7.4 Discussion

7.4.1. Archaeological features

7.4.1.1. Prehistorical

Two Middle Stone Age (MSA) material occurrences were recorded- NCHW001 and NCHW002.

NCHW001 is an isolated occurrence of debris with a flake and a geometrically faceted lithic point. The low-density surface scatter was shaped from Banded Ironstone Formation (BIF). The lithic material shows various degrees of weathering and is without substantial archaeological context or matrix and is therefore deemed of minor scientific importance and not conservation worthy (NCW).

The material is given a (Field Rating IV C). This means that it has been sufficiently recorded (in Phase 1). Therefore, it requires no further action.

The site documented at NCHW002 comprises MSA of knapping debris with flakes and cores. The low-density surface scatter was shaped from Banded Ironstone Formation (BIF) and crypto-crystalline silicates (CCS). The lithic material was recorded within the exposed limestone and pebble deposits along the Ga-Mogara River bed. The cultural material shows various degrees of weathering and is of low significance as an isolated occurrence. However, as the results of the desktop study have shown, within a broader context, the site should be considered within the archaeological context of previously recorded sites along the river bed and are therefore of medium significance.

The material is given a Local Grade IIIB rating. The heritage resources are of local importance and worthy of conservation. Therefore, it should be included in the heritage register and mitigated (high/ medium significance).

7.4.1.2. Historical

Three isolated cast-iron potsherds were recorded (NCHW003). Unfortunately, the material is without any archaeological context and of low significance and, therefore, not conservation worthy (NCW).

The material is given a (Field Rating IV C). This means that it has been sufficiently recorded (in Phase 1). Therefore, it requires no further action.



NCHW001



NCHW003



NCHW002



Figure 10 Heritage material recorded within the footprint

7.4.2. Palaeontological resources

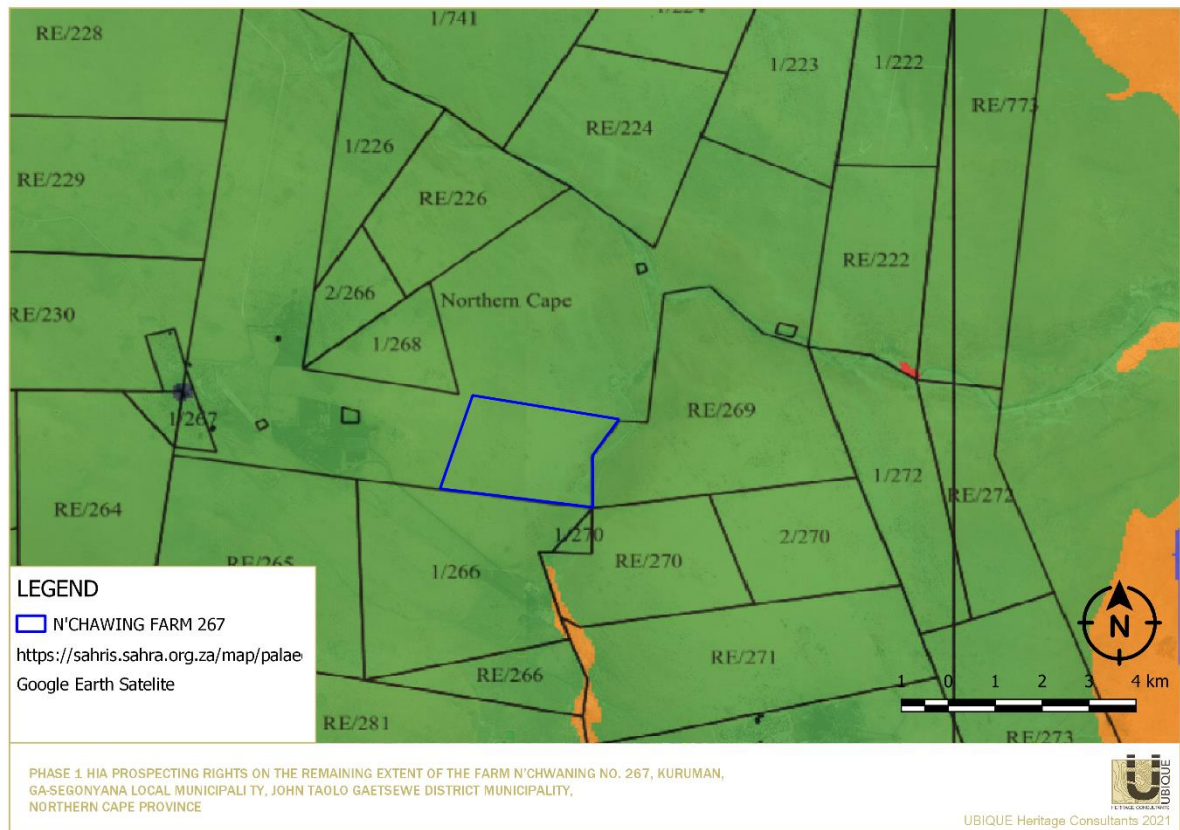


Figure 11 The Heritage Paleo screening tool and SAHRIS PalaeoSensitivity Map, indicating Moderate (green) palaeontological significance in the study area, (<https://screening.environment.gov.za/>; <https://sahrisk.sahra.org.za/map/palae>).

Elize Butler from Banzai Environmental conducted a palaeontological desktop assessment for the development footprint (see Appendix A). The proposed development is underlain by superficial Quaternary deposits of the Gordonia Formation (Kalahari Group). According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Gordonia Formation is Moderate (Almond and Pether 2008, SAHRIS website). Therefore, a Low Palaeontological Significance has been allocated to the proposed development. The project's construction may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage.



8. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

DESCRIPTION	DEVELOPMENT IMPACT		MITIGATION	FIELD RATING/ SIGNIFICANCE
Heritage resource				
NCHW001 Isolated MSA debris	Nature	Negative	No mitigation required.	Field Rating IV C Low significance
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		
NCHW002 MSA knapping debris within river high water line	Nature	Negative	Mitigation required: Buffer Zone	Field Rating of Local Grade IIIB High/medium significance
	Extent	Medium		
	Duration	High		
	Intensity	High		
	Potential of impact on irreplaceable resource	High		
	Consequence	High		
	Probability of impact	Medium		
	Significance	High		
NCHW003 Isolated cast-iron potsherds	Nature	Negative	No mitigation required.	Field Rating IV C Low significance
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		
PALAEONTOLOGICAL	Nature	Negative	No mitigation required.	Field Rating IV C Low significance
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		

There will not be any impact on heritage resources during the prospecting phase. However, further, development may have a detrimental effect on resources close to the Ga-Mogara river.

Regarding the impact on palaeontological resources, it is considered that the development will have a Negative Low impact on fossil resources. (Butler 2022).

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. No highly significant heritage sites or features were identified within the surveyed sections of the development footprint. However, the occurrences of lithic material found along the Ga-Mogara River are considered medium significance in the broader landscape. Therefore, we recommend that the banks of the Ga-Mogara River be considered significant and that a buffer zone of 100-120m be implemented from the centre of the river to protect any archaeological context these finds may have. No other mitigation is required.
2. A Low Palaeontological Significance has been allocated to the proposed development. Therefore the project's continuation may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage. However, 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 a palaeontologist can carry out that mitigation. Consequently, no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. (Butler 2022).
3. 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 excavation, 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 prove to be 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

UBIQUE Heritage Consultants were appointed by PSR Civil Construction 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 prospecting rights application on, the Remaining Extent of the Farm N'chwaning No. 267, Kuruman, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province.

We have determined that no significant heritage resources will be impacted negatively by the project and that the applicant may continue if they follow the recommendations of our heritage specialists and the decisions made by SAHRA.



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APPENDIX A

PALAEONTOLOGICAL DESKTOP ASSESSMENT PROSPECTING RIGHT APPLICATION
NCHWANING FARM 267 NEAR KURUMAN NORTHERN CAPE PROVINCE



BANZAI
ENVIRONMENTAL

PALAEONTOLOGICAL DESKTOP ASSESSMENT

PROSPECTING RIGHT
APPLICATION
NCHWANING FARM 267
NEAR KURUMAN

NORTHERN CAPE
PROVINCE

September 2022

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 favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, Regulations, and all other applicable legislation.
- I will 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 are facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application.
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct.
- I will perform all other obligations as expected as 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 offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.



Disclosure of Vested Interest

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

PALAEONTOLOGICAL CONSULTANT:

Banzai Environmental (Pty) Ltd

CONTACT PERSON:

Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE:



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 – Objective
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9
(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 7 Approach and Methodology
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternative;	Section 1 and 10
(g) An identification of any areas to be avoided, including buffers	Section 5 No buffers or areas of sensitivity identified



Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Geological and Palaeontological history
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 and 10
(k) Any mitigation measures for inclusion in the EMPr	Section 1 and 10
(l) Any conditions for inclusion in the environmental authorisation	Section 1 and 10
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 1 and 10
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 10
(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 10
(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	Section 3 compliance with SAHRA guidelines



Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
be applied to a specialist report, the requirements as indicated in such notice will apply.	



EXECUTIVE SUMMARY

Banzai Environmental was appointed by UBIQUE Heritage Consultants to conduct the Palaeontological Desktop Assessment (PDA) to assess the Proposed Prospecting Right Application on Nchwaning Farm 267 near Kuruman, Northern Cape Province. In accordance with the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PIA is necessary to confirm if fossil material could potentially be present in the planned development area, to evaluate the potential impact of the proposed development on the Palaeontological Heritage.

The proposed development is underlain by Quaternary superficial deposits of the Gordonia Formation (Kalahari Group). According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Gordonia Formation is Moderate (Almond and Pether 2008, SAHRIS website). 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 recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.



Impact Summary

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Construction of the residential development Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	30	Negative Medium impact	15	Negative Low impact



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Appendix A: CV



» INTRODUCTION

Prospecting on Nchwaning Farm 267 near Kuruman, in the Northern Cape Province, is proposed. The development will comprise three drilling sites (**Figure 1-2**). UBIQUE Heritage Consultants was appointed to conduct the Archaeological Impact Assessment (AIA), while Banzai Environmental was employed to conduct the Palaeontological Impact Assessment (PIA) as part of the Heritage Impact Assessment (HIA).

» QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This present study has been conducted by Mrs Elize Butler. She has conducted approximately 300 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-five years. She has experience in locating, collecting and curating fossils. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

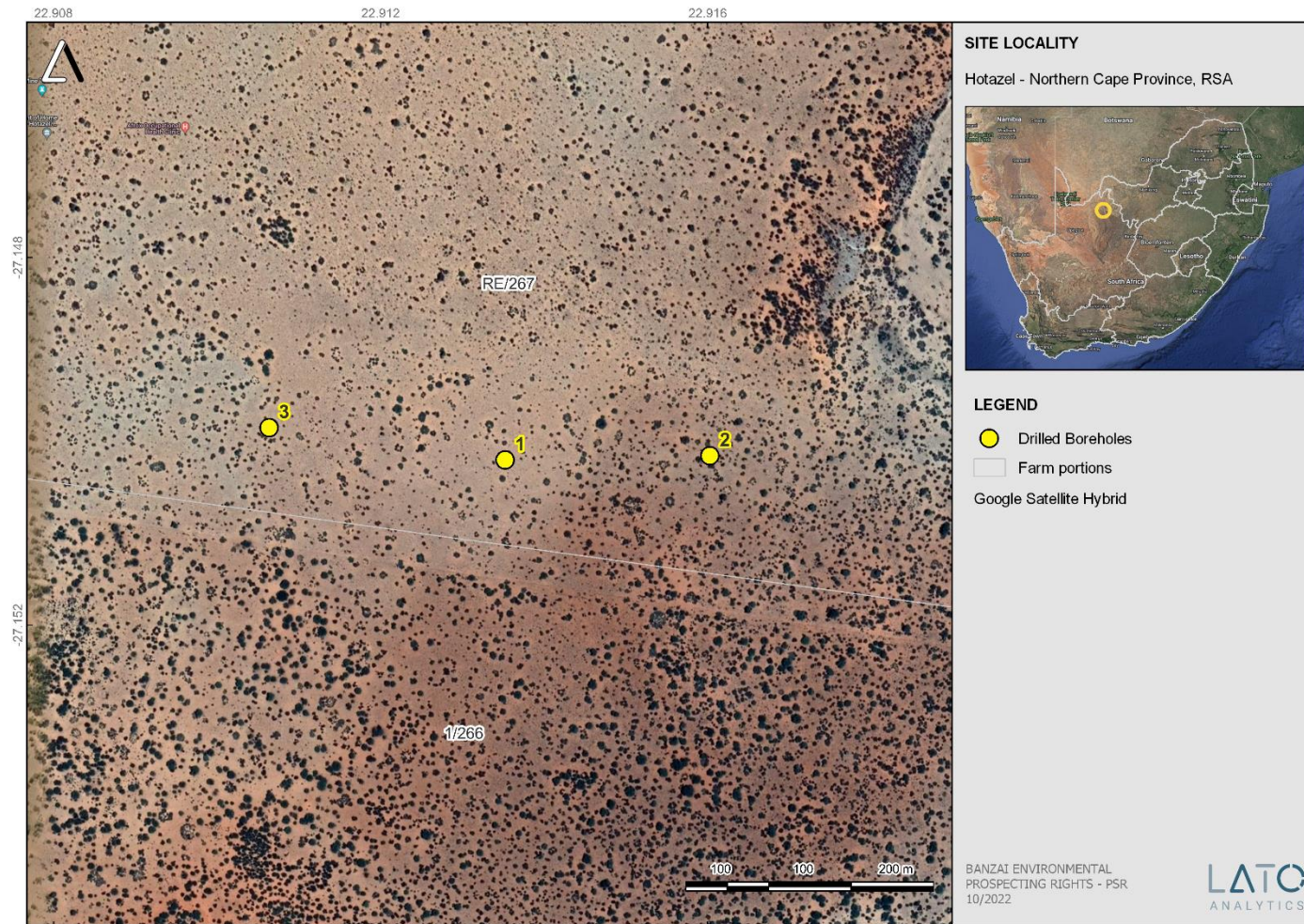


Figure 12: Proposed prospecting Right Application on Nchwaning Farm 267 near Kuruman, in the Northern Cape Province.

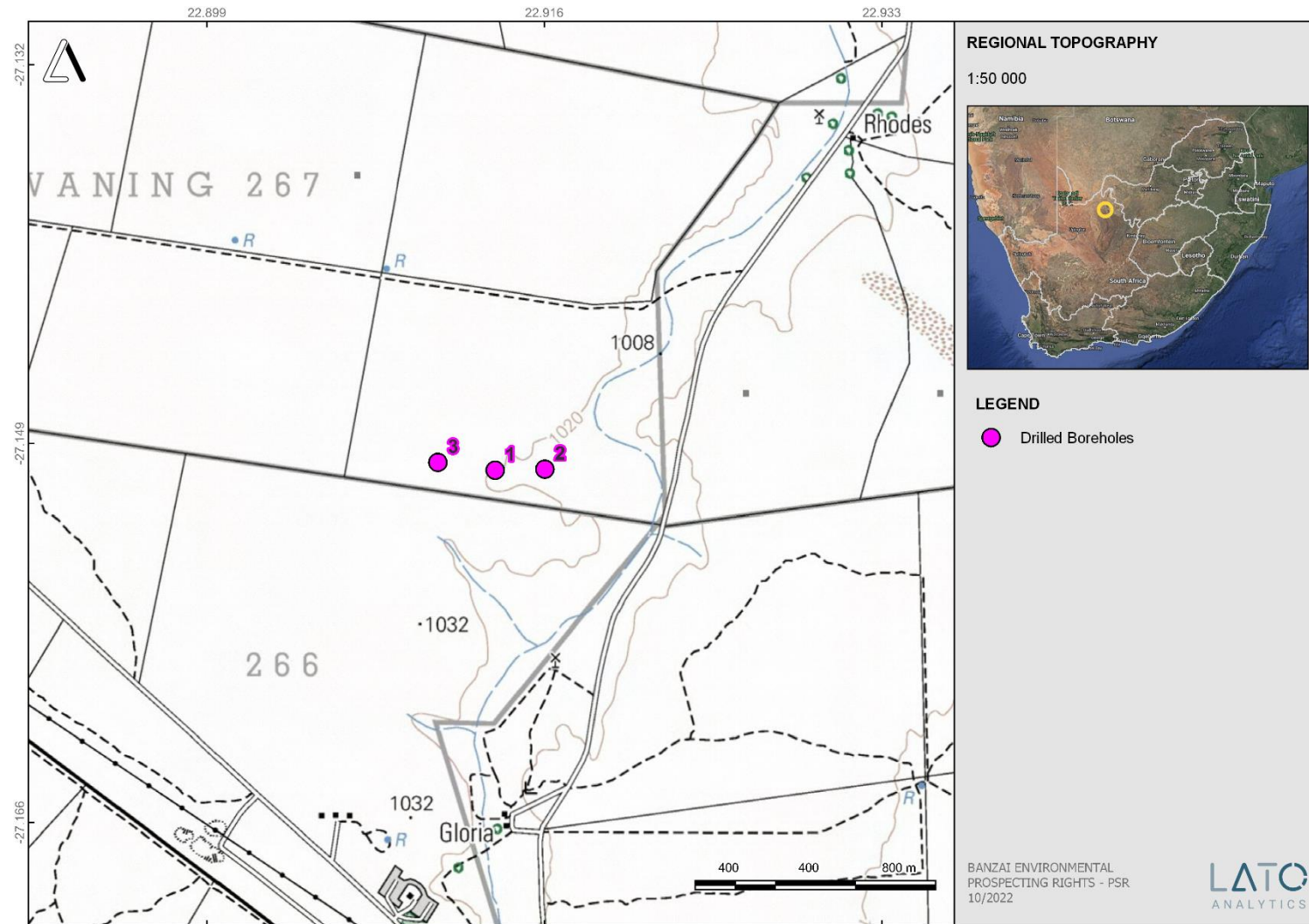


Figure 13: Locality Map of the Proposed prospecting Right Application on Nchwaning Farm 267 near Kuruman, in the Northern Cape Province



» **LEGISLATION**

National Heritage Resources Act (25 of 1999)

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

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 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- 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 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 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 the following comprehensive and legally compatible PIA report have 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 m² 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 re-zoning of a site exceeding 10 000 m² in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

» **OBJECTIVE**

The aim of a PIA is to decrease the effect of the development on potential fossils at the development site.

According to the "SAHRA Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the purpose of the PIA is: **1)** to identify the palaeontological importance of the rock formations in the footprint; **2)** to evaluate the palaeontological magnitude of the formations; **3)** to clarify the **impact** on fossil heritage, and **4)** to suggest how the developer might protect and lessen possible damage to fossil heritage.

The palaeontological status of each rock section is calculated as well as the possible impact of the development on fossil heritage by a) the palaeontological importance of the rocks, b) the type of development and c) the quantity of bedrock removed.



When the development footprint has a moderate to high palaeontological sensitivity a field-based assessment is necessary. The desktop and the field survey of the exposed rock determine the impact significance of the planned development and recommendations for further studies or mitigation are made. Destructive impacts on palaeontological heritage usually only occur during the construction phase while the excavations will change the current topography and destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation usually precede construction or may occur during construction when potentially fossiliferous bedrock is exposed. Mitigation comprises the collection and recording of fossils. Preceding excavation of any fossils a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. When mitigation is applied correctly, a positive impact as possible because our knowledge of local palaeontological heritage may be increased

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.

Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.

Description and location of the proposed development and provide geological and topographical maps.

Provide Palaeontological and geological history of the affected area.

Identification sensitive areas to be avoided (providing shapefiles/kml's) in the proposed development.

Evaluation of 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** 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

Implications of specialist findings for the proposed development (such as permits, licenses etc).

» **GEOLOGICAL AND PALAEOONTOLOGICAL HISTORY**

The proposed prospecting right application on Nchwaning Farm 267 near Kuruman, in the Northern Cape, is depicted on the 1:250 000 Kuruman 2722 Geological map (1979) (Council of Geoscience, Pretoria) (**Figure 3; Table 2**). The development is underlain by the Gordonia Formation of the Kalahari Group (Qs, white with yellow dots). The updated geology of the area is depicted in **Figure 4** and indicates that the proposed development is underlain by the Kalahari Group. The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (green) (**Figure 5**).

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). The fossil assemblages of the Quaternary are generally Low in diversity and occur over a wide range, and mostly have a Moderate Paleontological 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 bones, horn cores as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which include termite and insect 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 were formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Cenozoic but stated 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).

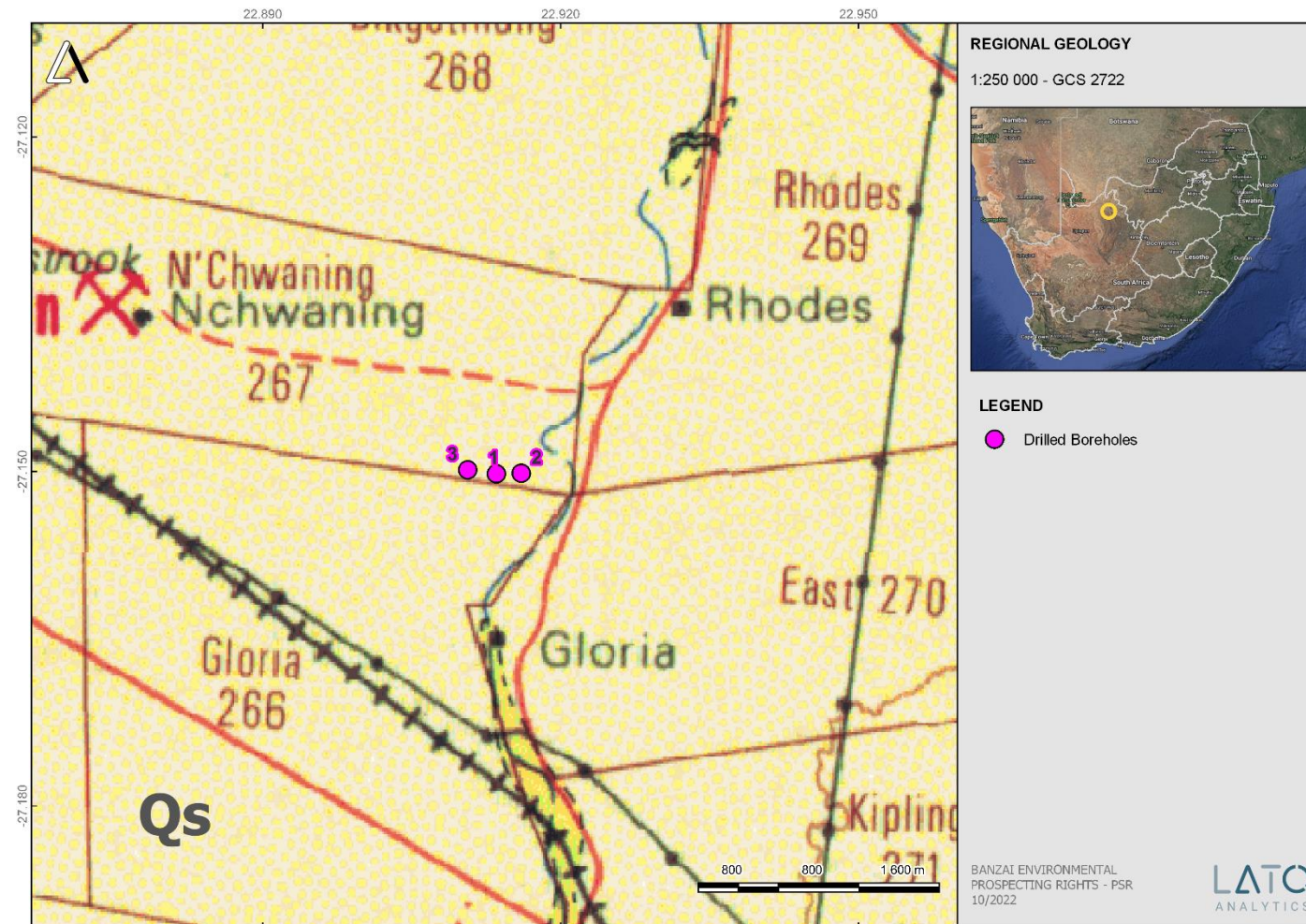


Figure 14: Extract of the 1:250 000 Kuruman 2722 (1979) Geological map (Council of Geoscience, Pretoria) indicating the surface geology of the proposed development, underlain by the Gordonia Formation of the Kalahari Group (Qg, dotted yellow).



Table 2: Legend of the 1:250 000 Kuruman 2722 (1979) Geological map (Council of Geoscience, Pretoria)

	FORMATION FORMASIE	MEMBER LID	LITHOLOGY LITOLIE	
QUATERNARY KWATERNÊR			Red to flesh-coloured wind-blown sand Rooi tot vleeskleurige waaisand	Qs
			Rubble Puin	
			River-terrace gravel Rivierterrasgruis	
TERTIARY TERSIER			Surface limestone Oppervlakkalksteen	Tl

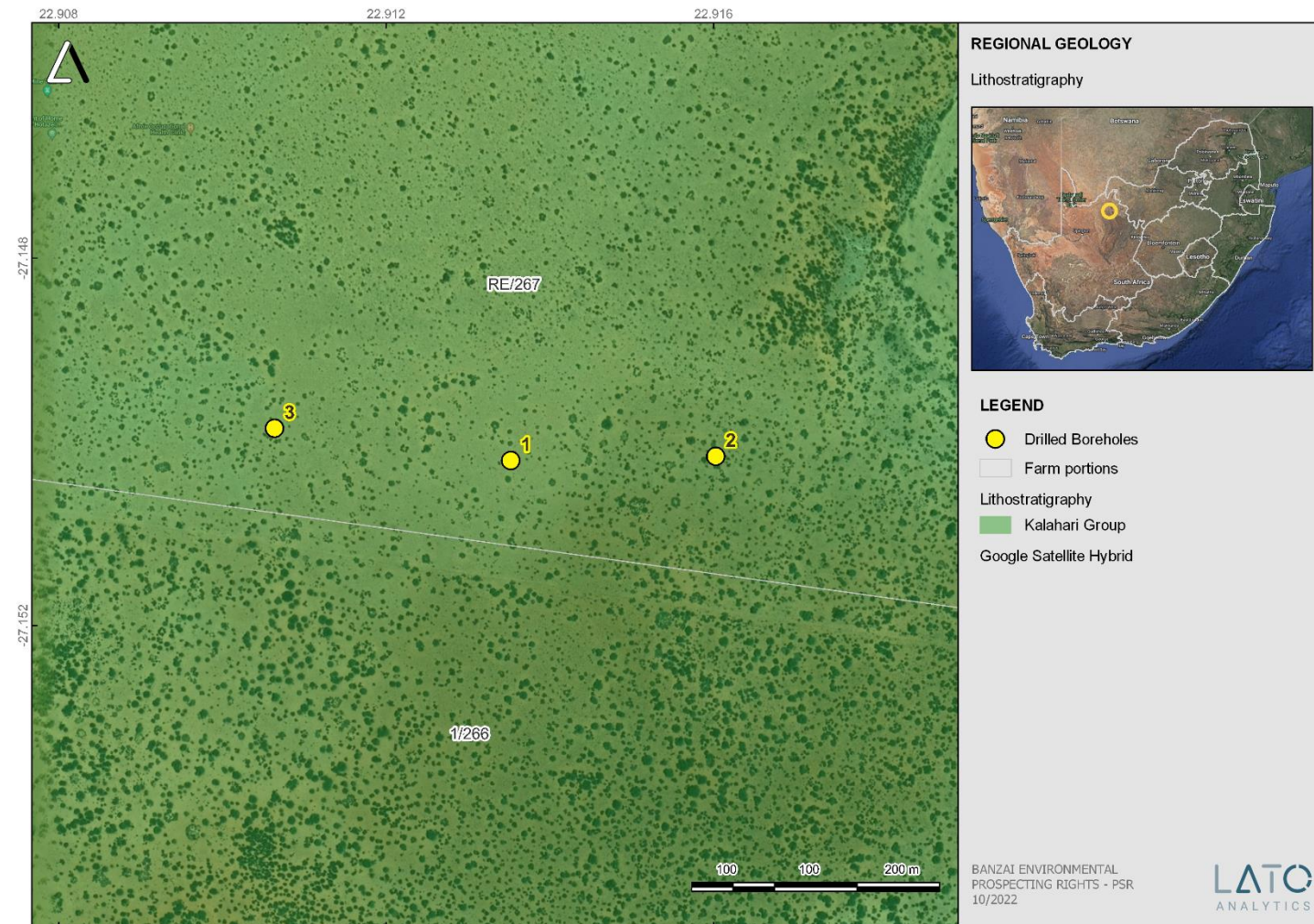


Figure 15: Updated geology indicates that the proposed development is underlain by the Kalahari Group.

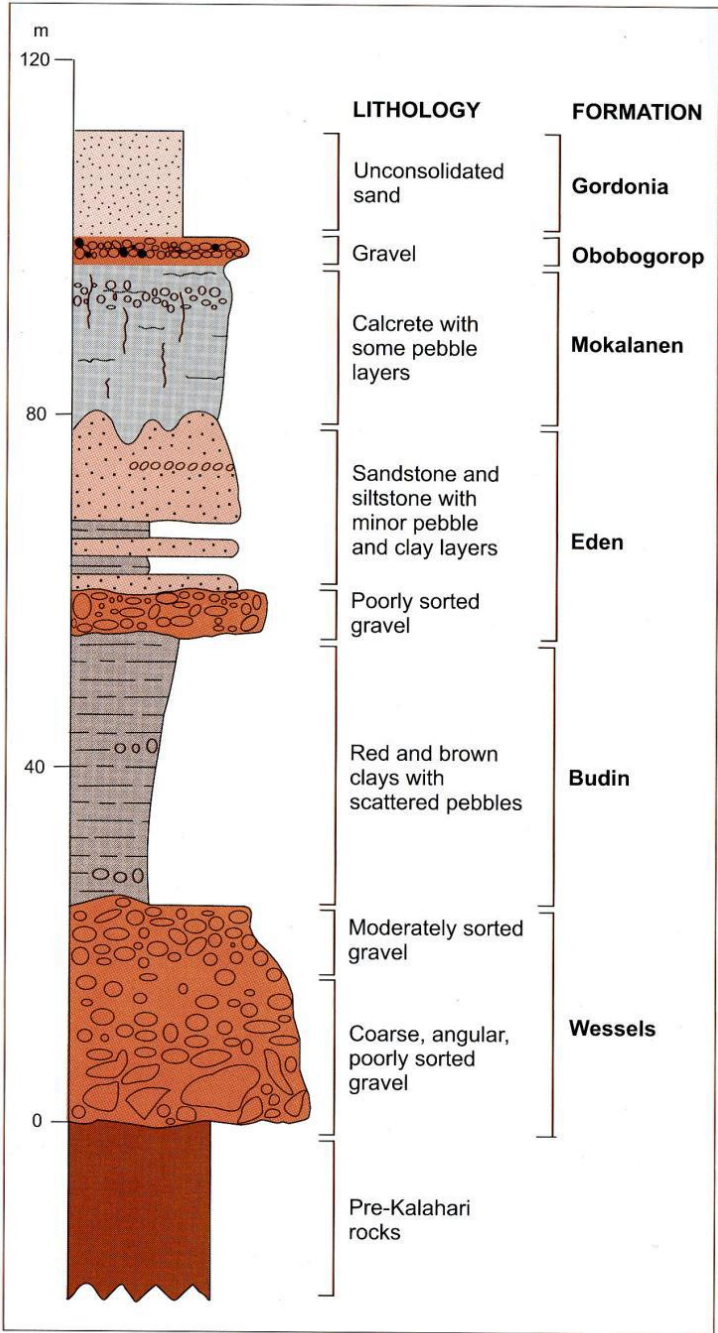


Figure 16: Stratigraphy of the Kalahari Group (Image taken from Partridge et al., 2006). Calcretes and aeolian sands of the Gordonia Formation possibly correspond to the Mokalanen Formation

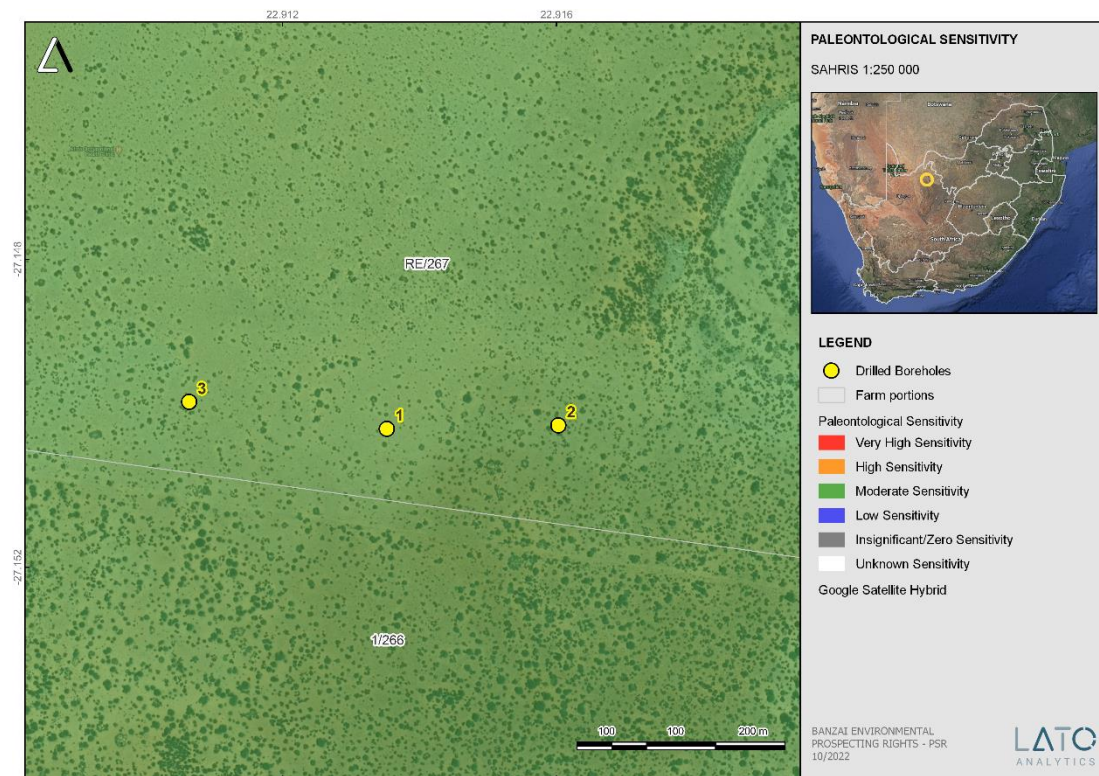


Figure 17: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed development in yellow.

According to the SAHRIS Palaeosensitivity map (**Figure 6**) the proposed development is underlain by sediments with a Moderate (green) Palaeontological Sensitivity.

Table 3: 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.

» GEOGRAPHICAL LOCATION OF THE SITE

The proposed prospecting right Application is located on Nchwaning Farm 267 near Kuruman, in the Northern Cape.

Table 4: GPS coordinates

Drill hole	Latitude	Longitude
1	27° 9'0.73"S	22°54'48.68"E
2	27° 9'0.57"S	22°54'57.69"E
3	27° 8'59.47"S	22°54'38.29"E

» METHODS

The aim of a desktop study is to evaluate the risk to palaeontological heritage in the proposed development. This includes all trace fossils and fossils. All available information is consulted to compile a desktop study and includes PIA reports in the same area, aerial photos, and Google Earth images, topographical as well as geological maps.

Assumptions and Limitations

When conducting a PIA several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas are used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies are used it is generally **assumed** that exposed fossil **heritage is present within the footprint**.

» 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 Kuruman 2722 (1979) Geological map (Council of Geoscience, Pretoria)

A Google Earth map with polygons of the proposed development was obtained from PSR Civil Construction CC .

» IMPACT ASSESSMENT METHODOLOGY

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 project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance 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		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
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.
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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.

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		The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

Impact of the development will be regional. The proposed development will have a negative impact on Fossil Heritage. The expected duration of the impact is assessed as potentially permanent to long term. The impact could occur. The significance of the impact occurring will be Very High. As fossil heritage will be destroyed the impact is irreversible. The impact on fossil heritage will be Medium pre-mitigation and Low post-mitigation.

Table 6: Impact Summary

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
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Construction of the residential development Loss of fossil heritage	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	30	Negative Medium impact	15	Negative Low impact
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» FINDINGS AND RECOMMENDATIONS

The proposed development is underlain by Quaternary superficial deposits of the Gordonia Formation (Kalahari Group). According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Gordonia Formation is Moderate (Almond and Pether 2008, SAHRIS website). 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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APPENDIX A – ELIZE BUTLER CV

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 29 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 National Museum, Bloemfontein
and Collection Manager 1998–currently

TECHNICAL REPORTS

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 Noupoot, Northern Cape Province. 2014. Bloemfontein.

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

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

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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.

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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.

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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.

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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.

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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.

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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 H₂ Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspruit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province. 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.

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