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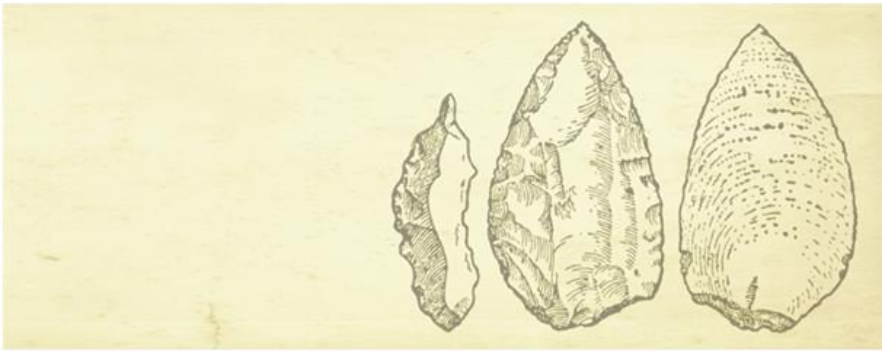

PHASE 1 EXPANSION AND UPGRADE OF PABALLELO JUPITER CEMETERY, UPINGTON

PHASE 1 HIA FOR THE PROPOSED UPGRADE AND EXPANSION OF THE PABALLELO JUPITER CEMETERY, UPINGTON, DAWID KRUIPER LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE.

PREPARED FOR:

ENVIROAFRICA CC

PREPARED BY:

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

6 APRIL 2023

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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: **Date: 2023-04-06**

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

UBIQUE Heritage Consultants

SUMMARY OF SPECIALIST EXPERTISE

SKY-LEE FAIRHURST

ARCHAEOLOGIST

Sky-Lee Fairhurst has been part of UBIQUE Heritage Consultants since 2019. She is responsible for research, desktop studies, report compilation and surveys. Miss Fairhurst obtained her BA in Archaeology and Biblical archaeology in 2016 and her BA Hons in Archaeology (*cum laude*) at the University of South Africa (UNISA) in 2018, focussing on research themes such as gender, households and Late Iron Age settlements. She is currently pursuing her interest in southern African agropastoral societies as an MA Archaeology student at the University of South Africa (UNISA). She is skilled at artefacts and archaeological illustrations. Over the past nine years, she has obtained considerable excavation and survey experience and worked on various sites, including Historical, Iron Age, and Palaeontological sites.

HEIDI FIVAZ

CRM ARCHAEOLOGIST & OBJECT CONSERVATOR

Heidi Fivaz has been a part of UBIQUE Heritage Consultants since 2016 and took over ownership in 2018. She is responsible for project management, surveys, research and report compilation. She holds a B.Tech. Fine Arts degree (2000) from Tshwane University of Technology, a BA in Culture and Arts Historical Studies degree (2012) from UNISA and received her BA (Hons) in Archaeology in 2015 (UNISA). She has received extensive training in object conservation from the South African Institute of Object Conservation and specialises in glass and ceramics conservation. She is also a skilled artefact and archaeological illustrator. Ms Fivaz was awarded her MA in Archaeology (with distinction) in 2021 by the University of South Africa (UNISA), focusing on historical and industrial archaeology. She is a professional member of the Association of South African Archaeologists and has worked on numerous archaeological excavation and surveying projects over the past 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 the Colonial period) from the University of South Africa. He has 12 years of experience in heritage management. He has worked on projects as diverse as the Zulti South HIA of Richards Bay Minerals, research on the David Bruce heritage site at Ubombo in Kwa-Zulu Natal, and various archaeological excavations and historical archaeological projects. He has worked with many rural communities to establish integrated heritage and land use plans and speaks Zulu fluently. Mr Engelbrecht established Ubique Heritage Consultants in 2012. The company moved from KZN to the Northern Cape and is currently based at Askham in the Northern Cape within the Mier local municipality in the Kgalagadi region. He had a significant military career as an officer, whereafter he qualified as an Animal Health Technician at Technikon RSA and UNISA. He is currently studying for his MA Degree in Archaeology.

EXECUTIVE SUMMARY

Project description

UBIQUE Heritage Consultants were appointed by the Enviroafrica CC as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA) to conduct a cultural heritage assessment to determine the impact of the proposed expansion and upgrade of the Paballelo Jupiter cemetery, Upington, Dawid Kruiper Municipality, on any sites, features, or objects of cultural heritage significance.

Findings and Impact on Heritage Resources

Two occurrences of low-density surface scatters of MSA lithics (PBL-001 and PBL-002) were recorded during the field survey. PBL-001 is situated directly within the proposed development area. However, the sample size is small, without context, and of low significance; the impact on these is negligible.

No other cultural material relating to the Iron Age, agri-pastoral farming communities or the historical/colonial period resources were identified.

There is an existing cemetery with historical graves. However, these graves are not situated within the proposed development area and will not be impacted by development.

The proposed development area is primarily underlain by the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). These rocks are approximately one to two billion years old and entirely unfossiliferous (Butler 2023 Appendix A).

Recommendations

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

1. The two MSA lithic occurrences recorded in and near the development footprint have been sufficiently recorded. The MSA cultural material identified is not conservation worthy. No further mitigation is recommended concerning these resources. Therefore,

from a heritage point of view, we recommend that the proposed development can continue.

2. The existing cemetery is of importance, and the developer should take note of any historical graves. However, these graves were not located within the proposed development.

3. The development footprint is underlain by the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). A low Palaeontological Significance has been allocated to the proposed development as the Palaeontological Sensitivity of the Gordonia Formation is low, while that of the ancient Precambrian basement rocks are zero. These rocks are approximately one to two billion years old and entirely unfossiliferous. 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. It is considered that the development of the proposed development is deemed appropriate and will not lead to detrimental impacts on the palaeontological resources of the area (Butler 2023).

4. Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490) must be alerted immediately as per section 36(6) of the NHRA. Depending on the nature of the finds, a professional archaeologist or palaeontologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources 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 inclu de any fixtures, fittings and equipment associated therewith.

1. INTRODUCTION

1.1 Scope of study

The project involves the proposed expansion and upgrade of the Paballelo Jupiter cemetery. Upington, in the ZF Mgcawu District Municipality and within the Dawid Kruiper Local Municipality in the Northern Cape Province. UBIQUE Heritage Consultants were appointed by Enviroafrica CC as independent heritage specialists in accordance with the National Environmental Management Act 107 of 1998 (NEMA) and in compliance with Section 38 of the National Heritage Resources Act 25 of 1999 (NHRA) to conduct a cultural heritage assessment (AIA/HIA) of the development area.

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

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

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

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

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

1.2 Assumptions and limitations

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

The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and 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 must be contacted for an assessment of the find. Observed or located heritage features and/or objects may not be disturbed or removed in any way until the heritage specialist has been able to assess the significance of the site (or material) in question.

2. TERMS OF REFERENCE

2.1 Statutory Requirements

2.1.1 General

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

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

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

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

2.1.2 National Heritage Resources Act 25 of 1999

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

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

2.1.3 Heritage Impact Assessments/Archaeological Impact Assessments

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

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

2.1.4 Management of Graves and Burial Grounds

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

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

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

> (3) *(a)* No person may, without a permit issued by SAHRA or a provincial heritage resources authority—
>
> *(a)* destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
>
> *(b)* destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
>
> *(c)* bring onto or use at a burial ground or grave referred to in paragraph *(a)* or *(b)* any excavation equipment, or any equipment which assists in the detection or recovery of metals.
>
> (4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)*(a)* unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation

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

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

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

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

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

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

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

3. STUDY APPROACH AND METHODOLOGY

3.1 Desktop study

The first step in the methodology was to conduct a desktop study of the heritage background of the area and the proposed development site. This entailed scoping and scanning historical texts/records and 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 from the 25th of January 2023 and completed a controlled-exclusive, pre-planned pedestrian and vehicular survey. We inspected the ground's surface, wherever the surface was visible. This was done with no substantial attempt to clear brush, sand, deadfall, leaves or other material that may cover the surface and with no effort to look beneath the surface beyond inspecting rodent burrows, cut banks and other exposures fortuitously observed.

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:

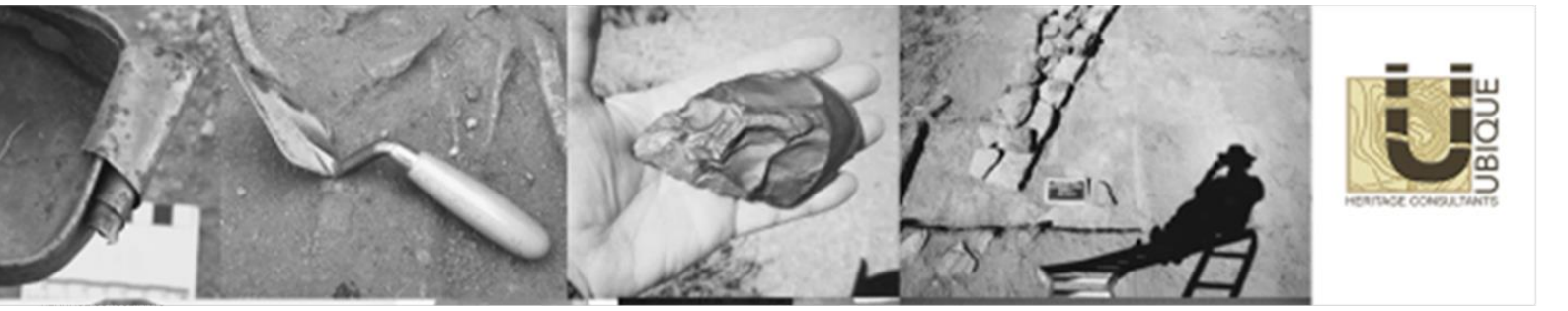
CRITERIA	RATING SCALES	NOTES
Nature	POSITIVE	An evaluation of the type of effect the construction, operation and management of the proposed development would have on the heritage resource.
	NEGATIVE	
	NEUTRAL	
Extent	LOW	Site-specific affects only the development footprint.
	MEDIUM	Local (limited to 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: • 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 Enviroafrica CC as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA) to conduct a cultural heritage assessment to determine the impact of the proposed expansion and upgrade of the Paballelo Jupiter cemetery, Upington, in the ZF Mgcawu District Municipality and within the Dawid Kruiper Local Municipality in the Northern Cape Province.

The project entails the expansion of the existing Jupiter Paballelo cemetery on ERF 5530 in Upington Northern Cape Province. The Dawid Kruiper Municipality plans to expand the Paballelo Jupiter cemetery on Erf 5530. The proposed cemetery expansion will be 20 000m^2 in extent and will be located adjacent to the current cemetery.

4.1 Technical information

PROJECT DESCRIPTION	
Project name	Phase 1 HIA Expansion and Upgrade of Paballelo Jupiter Cemetery, Upington.
Description	Phase 1 HIA for the Proposed Upgrade and Expansion of the Paballelo Jupiter Cemetery, Upington, Dawid Kruiper Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.
DEVELOPER	
Dawid Kruiper Municipality	
Development type	Upgrade of cemeteries
LANDOWNER	
Supply Chain Management Unit Michael Rooi	
Community Services W. Brand	
CONSULTANTS	
Environmental	Enviroafrica CC
Heritage and archaeological	UBIQUE Heritage Consultants
Palaeontological	Banzai Environmental
PROPERTY DETAILS	
Province	Northern Cape
District municipality	ZF Mgcawu
Local municipality	Dawid Kruiper Municipality (DKM)
Topo-cadastral map	2821AC 1:50 000

Farm name	Pabalelo Jupiter cemetery
Closest town	Upington
GPS Co-ordinates	Pabalelo Cemetery Entrance 27° 31' 11.9" S 19° 59' 58.7" E
PROPERTY SIZE	N/A
DEVELOPMENT FOOTPRINT SIZE	3,3 ha
LAND USE	
Previous	Agriculture and municipal servitude
Current	Agriculture and municipal servitude
Rezoning required	Yes
Sub-division of land	Yes

DEVELOPMENT CRITERIA IN TERMS OF SECTION 38(1) NHRA	YES/NO
Construction of a road, wall, power line, pipeline, canal or other linear forms of development or barrier exceeding 300m in length.	Yes
Construction of bridge or similar structure exceeding 50m in length.	No
Construction exceeding 5000m ^{2}.	Yes
Development involving three or more existing erven or subdivisions.	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.	Yes

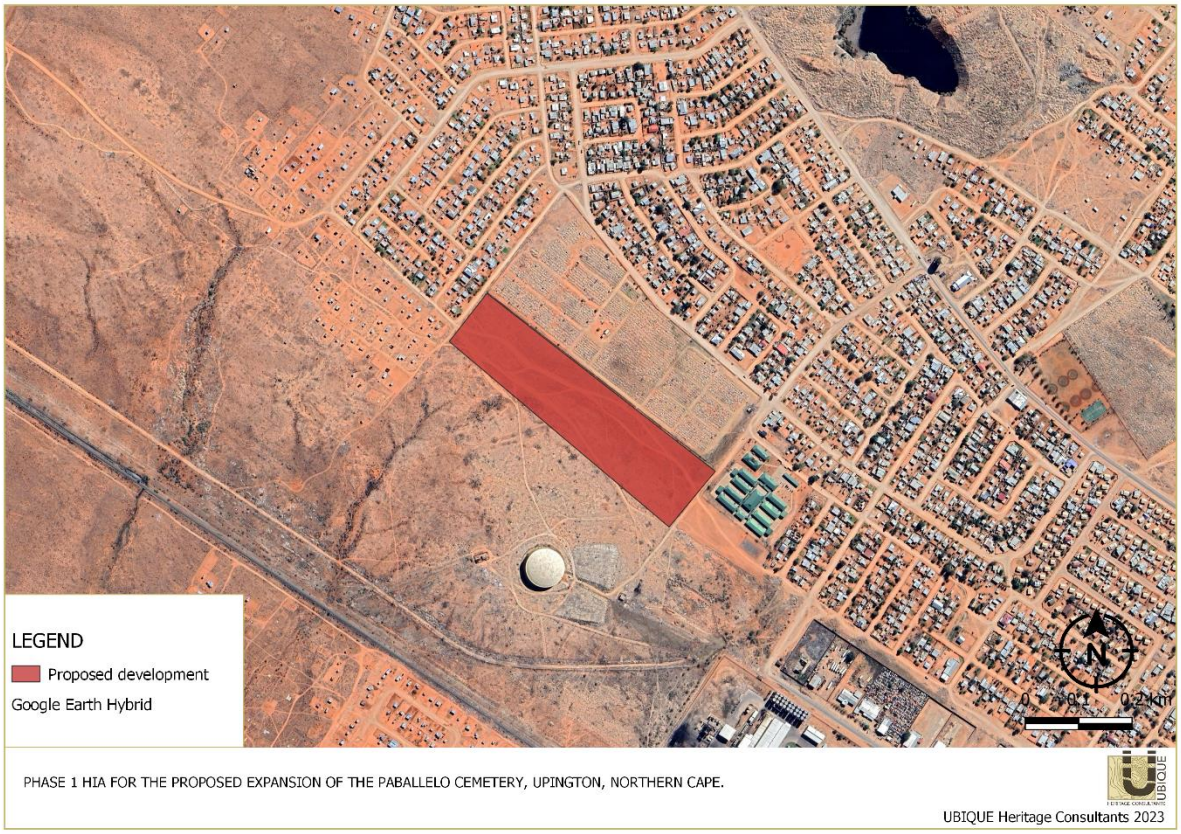


Figure 1 *Regional locality of the development footprint, indicated on Google Earth Satellite imagery.*

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

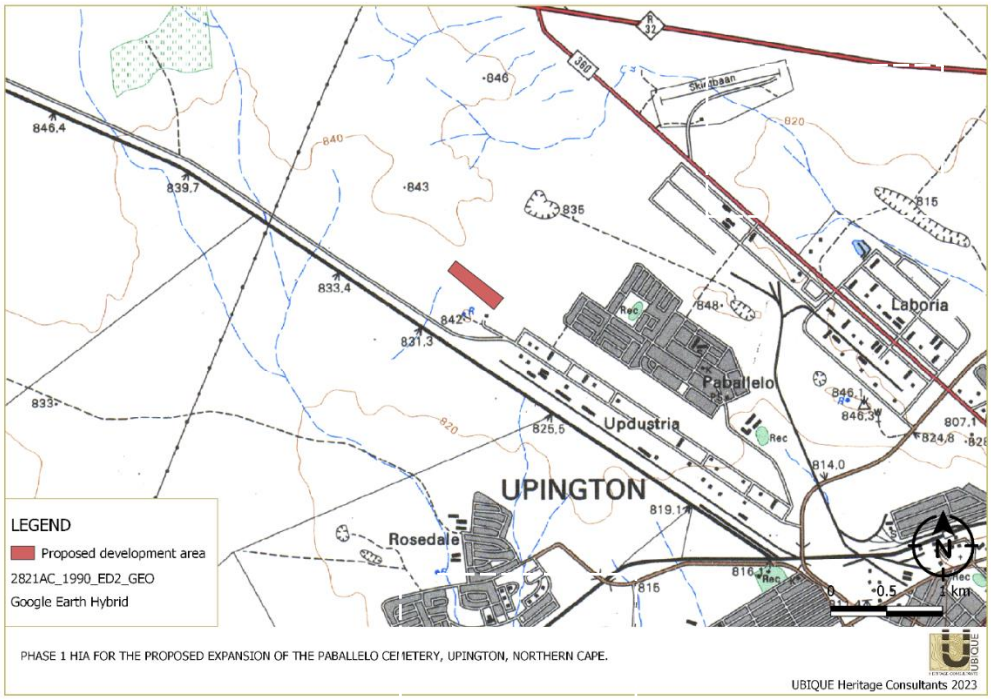


Figure 3 *Locality of the development footprint, indicated on 1: 50 000 2821AC map.*

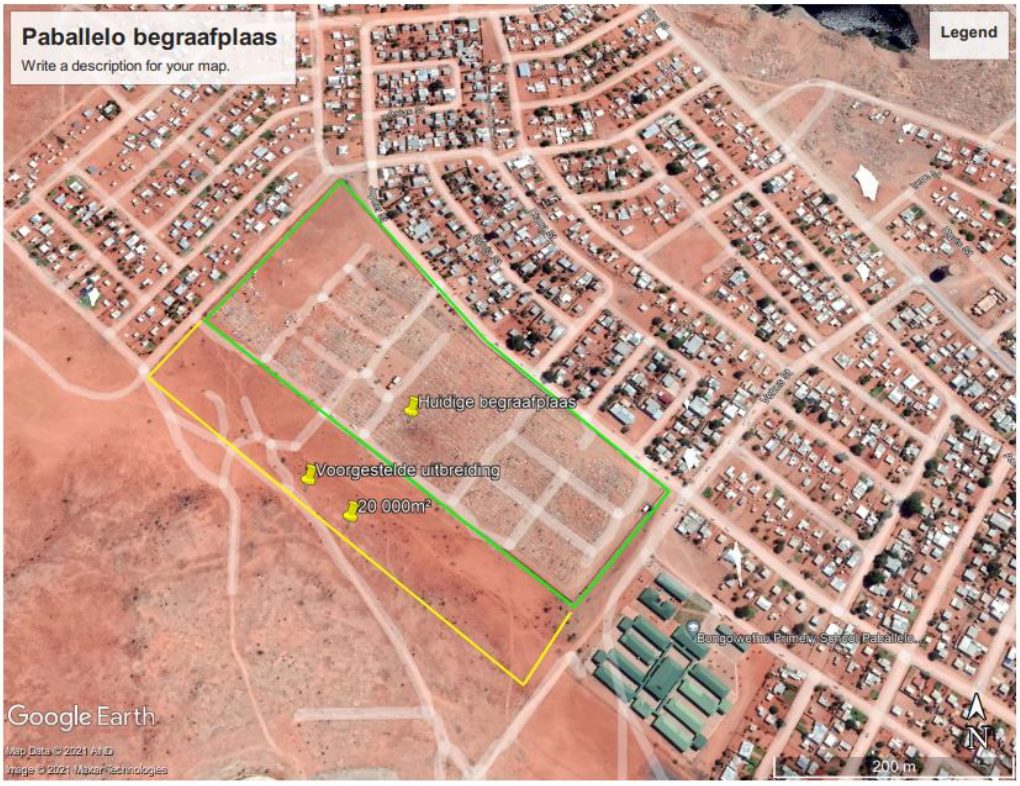


Figure 4 *Property boundary of the existing cemetery, and the proposed expansion of the cemetery. Image provided by client.*

5. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

5.1 Region: Northern Cape

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

5.1.1 Stone Age

The history of the Northern Cape is reflected in a rich archaeological landscape with a wealth of pre-colonial archaeological sites. Numerous sites have been identified and documented across the region. These sites have been dated to the Earlier, Middle and Later Stone Ages.

In southern Africa, the Stone Age can be divided into three periods. It is, however, critical to note that dates are relative and only provide a broad framework for interpretation. The division of the Stone Age, according to Lombard et al. (2012), is as follows:

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

In short, the Stone Age refers to humans that mainly utilised stone as their technological marker. Each sub-division is formed by industries where the assemblages share attributes or common traditions (Lombard et al. 2012). The ESA is characterised by flakes produced from pebbles, cobbles 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 rock engravings and paintings, have been identified in the Northern Cape (Beaumont 2008c; 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 (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 yielded small samples.

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

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

5.1.2 Iron Age

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

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

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

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

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

The South African Iron Age is generally characterised by farming communities with domesticated animals, cultivated plants, manufactured and 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). They comprised houses, raised grain bins, storage pits and animal kraals/byres, contrasting with pastoralists' and hunter-gatherers' temporary camps (Huffman 2007). It is evident in the archaeological record that IA groups had migrated with their material culture (Huffman 2002).

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

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). De Jong (2010) states 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 because of the gradually warmer and wetter climate. This later phase (the LIA) was accompanied by extensive stone-walled settlements, such as the Thlaping capital Dithakong, approximately 40 km north of Kuruman (De Jong 2010). The Sotho-Tswana and Nguni-speaking societies are the descendants of the LIA mixed farming communities. They found that the region was already sparsely inhabited by LSA Khoisan groups (the “first people”). De Jong (2010) comments that many of them were eventually assimilated by LIA communities. Only a few had managed to survive. Some of the surviving groups included the Korana and the Griqua. However, it should be mentioned that this contact period has often been referred to as the Ceramic LSA. It is often represented by sites such as the earlier mentioned Blinkklipkop specularite mine near Postmasburg and found cultural material at the Kathu Pan (De Jong 2010).

IA sites have been recorded in the northeastern part of the province. However, according to Kruger (2018), environmental factors delegated that the spread of IA farming westwards from the 17th century was constrained mainly to the areas east of the Langeberg Mountains. Nevertheless, there has been evidence of an IA presence as far as the Upington area in the 18th century (Kruger 2018). LIA people had briefly utilised the area close to the Orange River, as they had mined copper in the Northern Cape (Van Vollenhoven 2014).

5.1.3 Historical period

The Historical/Colonial period generally refers to the last 500 years when European settlers and colonialism entered southern Africa (Binneman et al. 2011). During the colonial frontier period, place names started becoming fixed on maps and farm names, specifically in a cadastral sense. Numerous names have Khoekhoegowab origin and, as Morris (2017a) states, encapsulate vestiges of pre-colonial/indigenous social geography. Interestingly, Morris (2017a) also states that genocide against the indigenous people is documented in the wider area. Certain mountainous areas (e.g. Gamsberg near Aggeneys and Namies) are likely to be massacre sites (Morris 2017a).

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 1- centuries mainly pertain to areas south of and along the Orange River (Morris 2018a, b & c). Hendrick Wikar and Robert Gordon, who, according to Morris (2018a, b & c) and Morris & Beaumont (1991), were two of the earliest travellers, had followed the river as far as and 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. These historical buildings and structures have been captured on the SAHRIS database in areas such as Kakamas, Kenhardt, Keimoes and Upington.

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

The region has been the backdrop to various incidents of conflict. Numerous factors such as population growth, increasing pressure on natural resources, the emergence of power blocs, attempts to control trade and the emergence of the Griquas, and penetration of the Korana and early white communities from the southwest resulted in a period of instability in South Africa. Furthermore, with the introduction of loan farms, in the second half of the 18th century, an influx of newcomers such as trekboers, European game hunters and livestock thieves contributed to the 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 the rest of southern Africa (De Jong 2010). This period was prompted by the incursion of displaced refugees associated with the Fokeng, Tlokwa, Hlakwana and Phuting groups (De Jong 2010).

Moreover, during the 1830s, the Voortrekkers started migrating northwards from the Cape Colony. This migration was due to their dissatisfaction with British rule (Eldredge 1987). The Voortrekkers' migration is known as the "Groot Trek" (Great Trek). The Voortrekkers had conflict with Tswana and missionary groups who had settled near Bechuanaland and Griqualand West (Van Vollenhoven 2014). 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 Rebelion (Engelbrecht & Fivaz 2019). It is believed that any military settlement related to the Koranna Wars would have been closer to the Orange River (Webley & Halkett 2014).

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

Bushmanland was one of the last regions of the Cape Province to be settled by early European farmers. This was because the region was very arid and situated quite far from Cape Town and the produce markets. Many of the farms in the Bushmanland area were only allocated after the introduction of the windpump to South Africa in the 1870s. In other words, the windpump made the arid lands accessible and suitable for grazing (Webley & Halkett 2012). Historical literature also confirms that San hunter-gatherers occupied Bushmanland during the early part of the 19th century. During the 19th century, Basters of mixed descent lived around the salt pans in

Bushmanland. They were, however, driven away from the land as the farms were surveyed and made available to European farmers (Webley & Halkett 2012). In the late 18th and early 19th centuries, with the introduction and implementation of the commando system, the Karoo 'Bushmen' were eventually destroyed or indentured into farm labour (ACRM 2015).

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

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

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

De Jong (2010) classifies the cultural landscape along the Gariep/Orange River as predominantly historic farmland. From the 1880s onwards, irrigation of the Orange River played a central role in the economy of the area in the vicinity of Upington (Legassick 1996). Hunter-gatherers shared the river's resources (Morris 1992). The beginning of irrigation in this area has been attributed to the Basters. By the 18th century, the Basters had focused on the Orange River (and Namaqualand) as a sanctuary from colonial rule (Mlilo 2019; Van der Walt 2015). They were regarded as "primitive pastoral people" who had "crude" ways to divert the river to their "little gardens" (Van der Walt 2015). The term "Basters" characterises a group of people of mixed percentage (white and Khoekhoe or slave and Khoekhoe). According to Van der Walt (2015), the term also implies an economic category encompassing property and being culturally European.

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

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

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

Orange River. However, the river is often referred to as the Gariep or Grootrivier (Engelbrecht & Fivaz 2020).

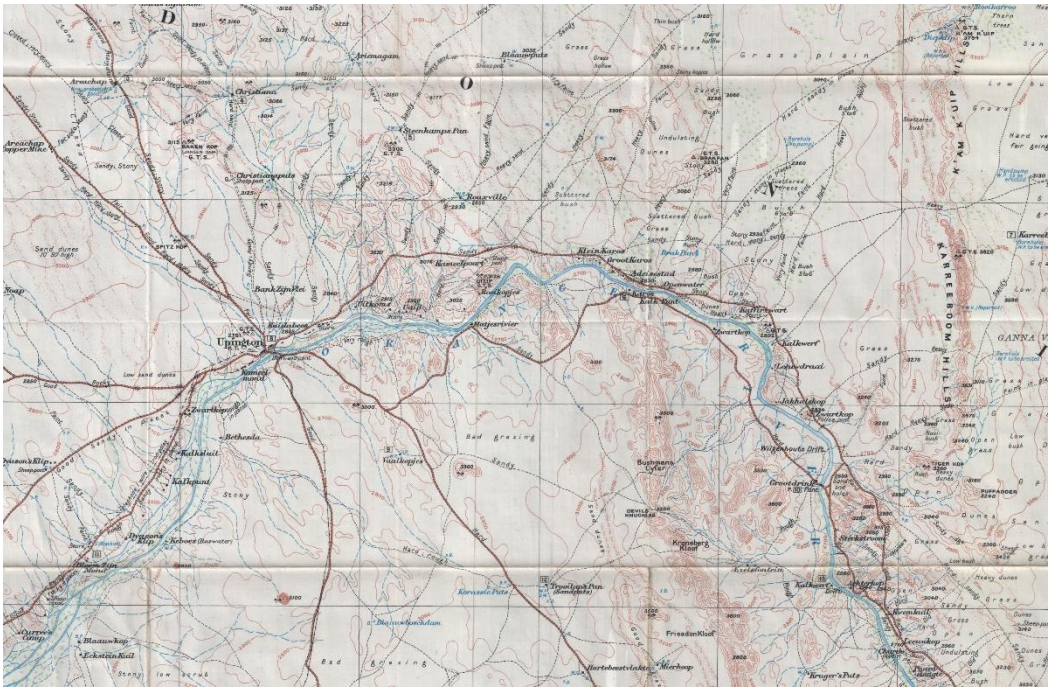


Figure 5 *Imperial Map of Upington and surrounds. Image from UCT digital collections, https://digitalcollections.lib.uct.ac.za/*

5.2 Local: Paballelo, Upington and surrounds

In 1778, Swedish-born traveller and explorer Hendrik Wikar reached the middle and lower reaches of the Orange River after a long land journey that started in Cape Town. As a deserter from the Dutch East India Company service, Wikar spent several years within the area and compiled a report of his experiences in exchange for a pardon (Ross 1975). He documented his encounters with Khoisan communities called the *Einiqua*, or *River People*. The *Einiqua* were divided into three "kraals": the *Namnykoa* near the Augrabies Falls, the *Kaukoa* on islands west of Keimoes, and the *Aukokoa* of Kanoneiland and other islands to the east. Their kraals consisted of a considerable amount of sheep and cattle, and they collected plants, hunted game, and cultivated dagga but no other crops, according to Wikar (Ross 1975). Amongst the pastoralist communities living on the islands were the *Anoe eis* people, whom Wikar characterised as "Bushmen". They possessed no domesticated stock, subsisting by fishing, game-trapping, hunting and gathering plant foods (Morris & Beaumont 1991). Colonel Robert Jacob Gordon, who visited the area in 1779, however, remarked that they were actually *Einiqua* (i.e. Khoi) who had "lost their cattle as a result of an argument with the *Namneiqua* village (Morris & Beaumont 1991).

During the late 17th century, Korana groups moving from the southwestern Cape to escape pressures from the European settlers trekked along the Gariep and settled among the Nama herders and groups of San hunter-gatherers living on the river islands and shores. The Korana or Kora were nomadic Khoikhoi groups that had become well-armed, accomplished horseback riders.

Some groups frequently raided the farms and communities south of the Gariep/Orange River. The Korana Wars of 1869 and 1878 resulted from increased land and resource competition between the Trekboers and Khoi and San groups. Along with mounted Boers and Basters, the Frontier Armed and Mounted Police and a small detachment of the Royal Artillery eventually managed to scatter and subjugate the Korana 'raider' groups. Klaas Lukas, a prominent Korana chief at Olyvenhouts Drift (Upington), played an essential role in defeating the Korana raiding groups with the support of most of the Korana, the Nama Afrikanders led by Jacobus Afrikander and several Griqua rebels under Gamka Pienaar. The Korana, who rejected a future under colonial rule, trekked further into the Kalahari. The Cape Government settled the Basters near Upington to form a buffer between the Boers and the Korana. Today, the Korana have almost completely disappeared as a separate group through assimilation with the population in the area (SAHO 2020).

Olyvenhouts Drift was the location of a mission station founded in 1871 by the German missionary Rev Schröder and named after the many wild olivewood trees growing in the area around the ford. The town was renamed Upington in 1884 after Sir Thomas Upington, the Attorney-General of the Cape Colony. Rev Schröder has been credited with the building of the irrigation canal from 1883 to 1885, but current views attribute the original idea to a local inhabitant by the name of Abraham September. By 1884, 77 farms were being irrigated by the canal (Orton 2015; Van Schalkwyk 2014).

6. HERITAGE SENSITIVITY

The Heritage Screening tool (https://screening.environment.gov.za/) shows low to medium significance with locations of high sensitivity directly within the proposed development, as well as to the west, northwest and southwest of the proposed project area.

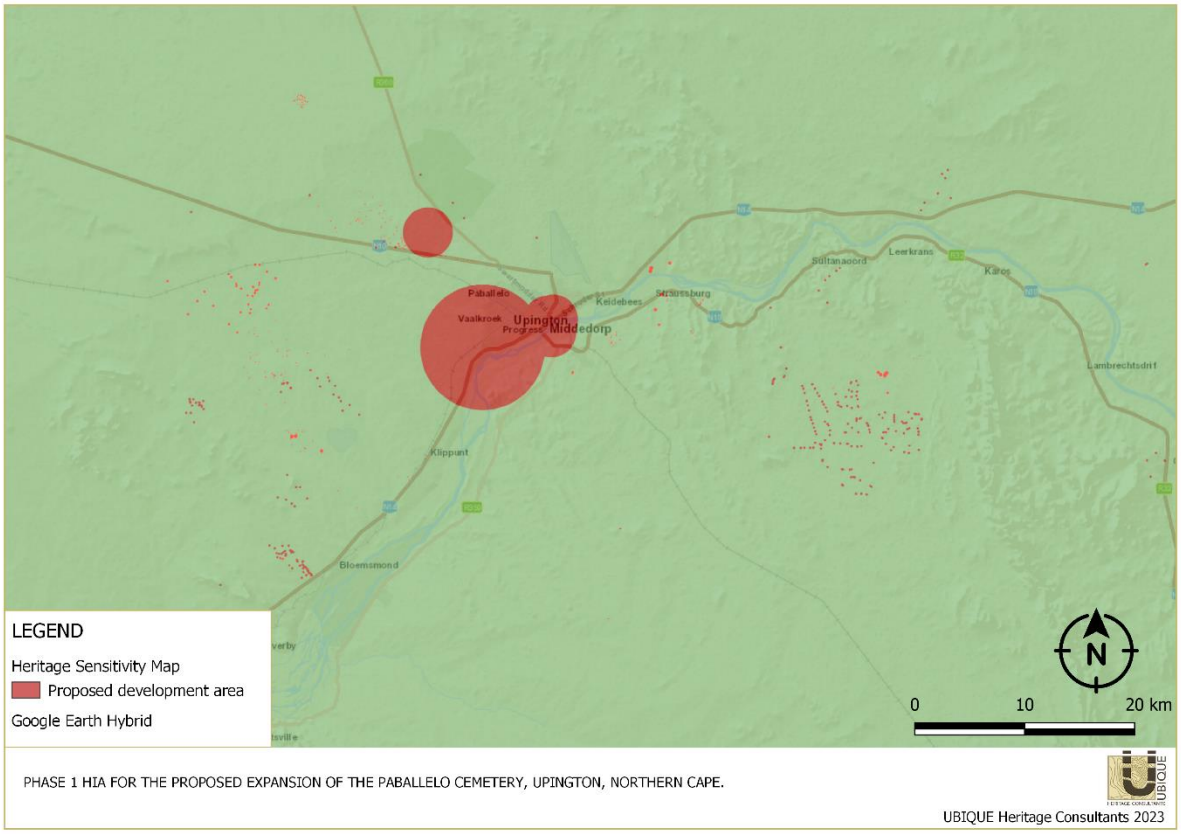


Figure 6 *The Project area indicated on the Heritage Screening tool (https://screening.environment.gov.za/)*

6.1 Summary of Local Heritage Resources: Paballelo and its surrounds

Due to the wide range of CRM reports, this desktop study does not include all the CRM reports done in the Upington area. However, most reports recorded artefacts and features relating to the Stone Age and the Historical Period. These reports were obtained from the SAHRA database.

The desktop study revealed that Impact Assessments had been done around the proposed development area. Some of the assessments reported on cultural material and features relating to the Stone Age and the Historical/Colonial era (e.g., Dreyer 2006; Fivaz & Engelbrecht 2020b and c; Kaplan 2016a and b; Morris 2013d; Rossouw 2015; Van der Walt 2020; Van Schalkwyk 2010; 2014 a and b; and Webley & Halkett 2014).

6.1.1 Stone Age

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

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Van Schalkwyk 2014a	Paballelo	Approx. -28.43178 21.21720 1.4 km E	MSA stone tools – flakes.
Van Schalkwyk 2014b	Dakotaweg	Approx. -28.44647 21.23927 3.8 km SE	MSA stone tools - cores and flakes
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 44.4" S 21° 17' 10.1" E 8.7 km SE	MSA blades, chunks, cores.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 41.5" S 21° 17' 09.7" E 8.6 km SE	MSA Core, flakes, chunks, chips.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 40.9" S 21° 17' 13.5" E 8.7 km SE	Cores and flakes.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 50.9" S 21° 17' 16.0" E 8.9 km SE	Cores and flakes.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 52.4" S 21° 17' 12.0" E 8.8 km SE	Cores, flakes, chunks.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 53.0" S 21° 17' 14.9" E 8.9 km SE	Cores, flakes, chunks.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 54.0" S 21° 17' 12.0" E 8.8 km SE	Core, flakes, chunks.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 55.2" S 21° 17' 08.9" E 8.7 km SE	Core and chunks.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 55.8" S 21° 17' 12.3" E 8.8 km SE	Core, chunks, blade, flakes, chips.
Fivaz & Engelbrecht 2020c		28° 27' 56.6" S	Core, chunks, flakes.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	21° 17' 16.5" E 9 km SE	
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 28' 00.1" S 21° 17' 11.1" E 8.9 km SE	Chips, chunks, blades, one scraper.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 28' 02.6" S 21° 17' 17.4" E 9 km SE	Chunks and Flakes.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 53.8" S 21° 17' 12.4" E 8.8 km SE	Scraper, small core, chunk, flake. Debris and scraper.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 44.9" S 21° 17' 05.8" E 8.5 km SE	Core, chunks, flakes.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 48.1" S 21° 16' 53.4" E 8.3 km SE	Chunks, blades, cores, flakes, scrapers, chips. Debris and tools.
Kaplan 2016b	Erf 745 Olyvenhoutsdrift	S28° 28.335' E21° 14.960' 6.1 km SE	Chunk.
Kaplan 2016b	Erf 745 Olyvenhoutsdrift	S28° 28.380' E21° 14.995' 6.2 km SE	Retouched cortex chunk.
Kaplan 2016b	Erf 745 Olyvenhoutsdrift	S28° 28.343' E21° 14.936' 6.1 km SE	Chunk.
Kaplan 2016b	Erf 745 Olyvenhoutsdrift	S28° 28.328' E21° 14.964' 6.1 km SE	Snapped utilised flake.
Dreyer 2006	Site 1 Olyvenhouts Drift	Approx. 28°29'15"S 021°04'03"E 14.5 km SW	A variety of stone flakes and flaked stone cores.
Kaplan 2016a	Farm 238/38 and Farm 338/38 Louisevale	In broader area: S28° 33.048' E21° 12.832	Various Banded Ironstone, indurated shale, and quartz flakes and chunks.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES / PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		12.9 km S	
Van der Walt 2020	Dyasons klip 5	28° 31' 11.1468" S 21° 01' 51.1681" E 19.2 km SW	LSA and MSA low density scatter.
Van der Walt 2020	Dyasons klip 5	28° 31' 04.6631" S 21° 01' 55.8370" E 19.1 km SW	LSA Blade on Jaspelite.
Van der Walt 2020	Dyasons klip 5	28° 31' 01.6824" S 21° 01' 52.3235" E 19.1 km SW	Broken LSA blade on Jaspelite.
Van der Walt 2020	Dyasons klip 5	28° 32' 12.1920" S 21° 02' 25.9368" E 19.5 km SW	LSA and MSA. Several miscellaneous tools, mostly on quartzite, some with faceted striking platform indicative of MSA. Quartz and Jaspelite flakes possibly LSA.
Van der Walt 2020	Dyasons klip 5	28° 32' 18.6181" S 21° 02' 33.5472" E 19.4 km SW	Discoid core on Jaspelite possibly LSA.
Van der Walt 2020	Dyasons klip 5	28° 32' 57.8185" S 21° 03' 48.0564" E 18.6 km SW	LSA and MSA. Various flakes and broken points scattered between quartz rocky outcrop and LSA bladelet.
Van der Walt 2020	Dyasons klip 5	28° 32' 49.5853" S 21° 03' 41.5332" E 18.6 km SW	Quartzite blades and flakes possibly MSA. Unidirectional cores on Jaspelite and smaller flakes on Jaspelite possibly LSA.
Van der Walt 2020	Dyasons klip 5	28° 33' 15.8435" S 21° 02' 12.3469" E 21 km SW	LSA and MSA flakes on Jaspelite and Quartzite Slightly elevated with Calcrete outcrop.
Van der Walt 2020	Dyasons klip 5	28° 33' 16.2107" S 21° 01' 53.4828" E 21.4 km SW	Stone Age Scrapers on banded ironstone. Slightly elevated rocky ridge.
Van der Walt 2020	Dyasons klip 5	28° 31' 20.9207" S 21° 02' 00.2616" E 19.2 km SW	Levallois MSA point on quartz.
Van der Walt 2020	Dyasons klip 5	28° 34' 34.3451" S 21° 02' 50.2115" E 21.9 km SW	LSA and MSA Flakes and cores on banded iron stone and quartz. Mainly LSA.
Van der Walt 2020	Dyasons klip 5	28° 34' 43.2265" S 21° 02' 57.2281" E 21.9 km SW	Rock outcrop with hollow that could hold seasonal rain. Several LSA flakes with Discoid core on Jaspelite with cortex.
Van der Walt 2020	Dyasons klip 5	28° 33' 16.8875" S 21° 03' 03.7081" E 19.9 km SW	LSA Flakes on Jaspelite.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Van der Walt 2020	Dyasons klip 5	28° 34' 46.6679" S 21° 05' 29.8537" E 19.4 km SW	MSA Miscellaneous flakes on hornfell.
Van der Walt 2020	Dyasons klip 5	28° 34' 58.9404" S 21° 05' 41.2260" E 19.6 km SW	LSA and MSA Flakes and cores mostly on Jaspelite.
Van der Walt 2020	Dyasons klip 5	28° 31' 06.6827" S 21° 01' 53.1877" E 19.1 km SW	MSA Blade and miscellaneous Flakes.
Van der Walt 2020	Dyasons klip 5	28° 31' 27.2028" S 21° 01' 37.5565" E 19.9 km SW	Quartzite Hammer stone with pitting.
Van der Walt 2020	Dyasons klip 5	28° 31' 26.9976" S 21° 01' 40.1808" E 19.8 km SW	MSA Quartzite Scraper, Quartzite core and pointed flake.
Van der Walt 2020	Dyasons klip 5	28° 32' 04.9163" S 21° 02' 19.6441" E 19.5 km SW	Unidirectional MSA Quartzite cores.
Van der Walt 2020	Dyasons klip 5	28° 32' 24.1008" S 21° 02' 29.5297" E 19.6 km SW	MSA blades.
Van der Walt 2020	Dyasons klip 5	28° 33' 20.0592" S 21° 02' 03.4188" E 21.2 km SW	Low density MSA and LSA scatter on open area.
Van der Walt 2020	Dyasons klip 5	28° 33' 19.2348" S 21° 02' 00.6828" E 21.3 km SW	Low density MSA and LSA scatter on open area.
Van der Walt 2020	Dyasons klip 5	28° 31' 14.7792" S 21° 01' 48.8567" E 19.4 km SW	MSA Quartzite flake, Undiagnostic Jaspelite Flake, LSA Jaspelite Scraper.
Van der Walt 2020	Dyasons klip 5	28° 31' 39.9719" S 21° 02' 07.1125" E 19.4 km SW	MSA Broken blade and pointed flake.
Van der Walt 2020	Dyasons klip 5	28° 33' 18.4141" S 21° 02' 56.1877" E 20.1 km SW	Various MSA and LSA flakes and cores.
Morris 2013d	Dyasons Klip	-28.59667 21.09101 21 km SW	Widely scattered/isolated stone artefacts. Predominantly on jaspilite and most likely MSA.
Morris 2013d	Dyasons Klip	-28.58968	

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		21.08932 20.4 km SW	High density of stone artefacts, mainly jaspilite, MSA. Context (lag deposit in drainage line) is poor.
Morris 2013d	Dyasons Klip	-28.57582 21.07411 20.1 km SW	Isolated stone artefact.
Morris 2013d	Dyasons Klip	-28.56243 21.05805 20 km SW	Grinding surfaces ranging from definite to less than certain. A small number of stone tools were found in the vicinity, as well as broken bottle glass.
Morris 2013d	Dyasons Klip	-28.56228 21.05834 20 km SW	Lower grindstone. LSA flakes on surface in the vicinity.
Fivaz & Engelbrecht 2020b	Boegoeberg Settlement RE/48/2627	28° 33' 01.2" S 21° 44' 33.2" E 54.4 km SE	ESA/MSA Chunks and flakes debris.
Fivaz & Engelbrecht 2020b	Boegoeberg Settlement RE/48/2627	28° 34' 02.2" S 21° 44' 18.1" E 54.4 km SE	Flakes and chips debris.
Van Schalkwyk 2010	Vaal Koppies 40	S 28.45970 E 21.34001 13.7 km SE	Quarry site where flakes were removed for the making of stone tools.
Van Schalkwyk 2010	Vaal Koppies 40	S 28.45939 E 21.34000 13.7 km SE	Quarry site where flakes were removed for the making of stone tools.
Webley & Halkett 2014	Dyasons Klip 454	-28.53913399 21.03615141 20 km SW	Light scatter of banded ironstone flakes. 1 MSA with prepared butt, retouch, unifacial flake with notch at end.
Webley & Halkett 2014	Dyasons Klip 454	-28.53422077 21.03242087 20 km SW	Banded ironstone and a quartz flake on slight calcrete exposure.
Webley & Halkett 2014	Dyasons Klip 454	-28.53512216 21.03418853 19.9 km SW	Quartz flake and a banded ironstone flake.
Webley & Halkett 2014	Dyasons Klip 454	-28.53632572 21.03668525 19.8 km SW	Long flake blade on weathered hornfels with cortex on one side.
Webley & Halkett 2014	Dyasons Klip 454	-28.53810403 21.03612986 19.9 km SW	Banded ironstone flakes. Some artefacts are very small and very weathered.
Webley & Halkett 2014	Dyasons Klip 454	-28.53599455 21.04044151	Scatter of quartz flakes and chunks on bare piece of ground.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS

HIA/AIA	SITE	COORDINATES / PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
		19.5 km SW	
Webley & Halkett 2014	Dyasons Klip 454	-28.49237706 20.99997788 20.8 km WSW	A quartz ridge. Quartz flakes and a core. Some OES.
Webley & Halkett 2014	Dyasons Klip 454	-28.48874124 20.99778760 20.9 km WSW	Number of black (basalt?) cores and flakes. There are some outcrops nearby.
Webley & Halkett 2014	Dyasons Klip 454	-28.49627774 21.00194369 20.8 km WSW	Quartz outcrop. A quartzite radial core. Mainly banded ironstone flakes.
Webley & Halkett 2014	Dyasons Klip 454	-28.50466191 21.01024655 20.4 km SW	Basalt handaxe on a cleared surface. Nearby are black bedrock outcrops and evidence of knapping.
Webley & Halkett 2014	Dyasons Klip 454	-28.54151362 21.05379062 18.9 km SW	Flat area with two artefacts, a quartz flake and a banded ironstone flake.
Webley & Halkett 2014	Dyasons Klip 454	-28.58957109 21.09013472 20.3 km SW	Weathered banded ironstone artefacts on the edge of the stone outcrop.
Webley & Halkett 2014	Dyasons Klip 454	-28.54860747 21.06153416 18.7 km SW	Quartzite flake with retouch, quartzite irregular core; flaked banded ironstone cobble with cortex. A single MSA flake with prepared platform.
Webley & Halkett 2014	Dyasons Klip 454	-28.54477300 21.03655701 20.4 km SW	Quartz cores, large quartz flake and wind-blasted broken MSA flake on quartzite.
Webley & Halkett 2014	Dyasons Klip 454	-28.54500099 21.03682296 20.3 km SW	Area of denser quartz MSA flakes on a calcretes surface.
Webley & Halkett 2014	Dyasons Klip 454	-28.53918202 21.03585502 20 km SW	Wind blasted MSA on yellow banded ironstone, some artefacts with retouch.
Webley & Halkett 2014	Dyasons Klip 454	-28.53930498 21.03560197 20 km SW	crude biface?
Webley & Halkett 2014	Dyasons Klip 454	-28.51364597 21.03096200 19 km SW	MSA. Small open area with banded ironstone, hornfels and quartzite flakes.
Webley & Halkett 2014	Dyasons Klip 454	-28.54741196 21.04788397 19.6 km SW	Quartz outcrop with some quartz scatter as well as quartzite and banded ironstone flakes.

STONE AGE RESOURCES RECORDED IN A 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Webley & Halkett 2014	Dyasons Klip 454	-28.59070499 21.09008996 20.5 km SW	Possible grinding surface (x 3) on rough slab.
Webley & Halkett 2014	Dyasons Klip 454	-28.57721399 21.07466801 20.1 km SW	MSA. Small quartz outcrop and other more volcanic rock too. Quartz debris, flakes and chunks.
Webley & Halkett 2014	Dyasons Klip 454	-28.55016701 21.06125697 18.9 km SW	Low density quartz and banded ironstone. Scatter of MSA. Wind blasted. Some retouch.
Webley & Halkett 2014	Dyasons Klip 454	-28.54916302 21.06187304 18.7 km SW	Extensive quartz gravel area. Occasional banded ironstone flakes, chunks and cores. Some with cobble cortex.

6.1.2 Rock Art

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

6.1.3 Iron Age

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

6.1.4 Historical/Colonial period

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

HISTORICAL PERIOD RESOURCES RECORDED IN 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Fivaz & Engelbrecht 2020c		28° 27' 41.5" S 21° 17' 13.6" E	Ca 1890s hole-in-cap tins surface scatter.

HISTORICAL PERIOD RESOURCES RECORDED IN 50 KM RADIUS

HIA/AIA	SITE	COORDINATES / PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	8.8 km SE	
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 52.2" S 21° 17' 06.9" E 8.7 km SE	Ca 1890s hole-in-cap tins surface scatter.
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 28' 00.1" S 21° 17' 11.1" E 8.9 km SE	Ca 1890s hole-in-cap tins surface scatter.
Dreyer 2006	Site 1 Olyvenhouts Drift	General area: 28°29'15"S 021°04'03"E 14.5 km WSW	A heavily soldered food tin resembling British rations from the Anglo-Boer War (1899-1902) was found. Possibility of a British camp in the vicinity during the War, but nothing else to confirm this expectation was discovered.
Morris 2013d	Dyasons Klip	-28.59015 21.09025 20.4 km SW	Twentieth-century cement feature. Most likely related to farming activity/water provision to animals.
Morris 2013d	Dyasons Klip	-28.55377 21.04126 20.6 km SW	Collapsed structure, adjacent kraal, nearby ash heap. This may have been a farm worker's dwelling
Morris 2013d	Dyasons Klip	-28.55748 21.04328 20.7 km SW	Collapsed structure. No definitive ash heap was found: small quantities of glass, porcelain and metal were found around the dwelling. Most likely age is mid-twentieth century.
Fivaz & Engelbrecht 2020b	Boegoeberg Settlement RE/48/2627	-28° 33' 01.2" S 21° 44' 33.2" E 54.6 km SE	Surface scatter of Ammunition rests - recent past 1960s, 1980s
Fivaz & Engelbrecht 2020b	Boegoeberg Settlement RE/48/2627	28° 33' 20.7" S 21° 44' 06.7" E 53.9 km SE	Surface scatter of Ammunition rests recent past 1960s, 1980s
Van Schalkwyk 2010	Vaal Koppies 40	S 28.43691, E 21.34298 13.7 km E	Monument honouring Conrad Strauss who gave the land for the establishment of the village of Straussburg
Webley & Halkett 2014	Dyasons Klip 454	-28.51476135 21.01546680 20.4 km SW	Four houses, single-roomed. With no roofs, doors or window panes. Inside 2 houses are packs of tin cans. The paper packets have disintegrated and tins tumbling out doors. Compound for mine?
Webley & Halkett 2014	Dyasons Klip 454	Approx, -28.53376388 21.04651613 18.9 km SW	Old mine crane, a 4 stroke engine with winch, some isolated metal cans (old sardine can).
Webley & Halkett 2014	Dyasons Klip 454	-28.53332500 21.04194104 19.2 km SW	Old diggings – unsure of date – done mechanically.
Webley & Halkett 2014	Dyasons Klip 454	-28.54709202 21.04705601 19.7 km SW	Collapsed mud brick structure with stone foundation. Possibly shepherd's house. Interior 2.5 m x 2.3 m. Few tin cans in the vicinity. Paraffin tin. No glass.
Webley & Halkett 2014	Dyasons Klip 454	-28.54936201 21.04375002 20.1 km SW	A higher distribution of Orange River gravel type (stones/cobbles) localised near a small cement reservoir. It seems these stones may have been introduced historically to be mixed with the cement for the reservoir. Banded ironstone,

HISTORICAL PERIOD RESOURCES RECORDED IN 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
			hornfels, quartzite and some schist? There is one small uniface (small handaxe) on banded ironstone.

The Upington area has several Provincial Heritage Sites, such as buildings, there are also several monuments, memorials, and burial grounds all of which are listed in this table below, which can also be found on the SAHRA Database:

HERITAGE SITES IN AND AROUND UPINGTON AREA DOCUMENTED ON THE SAHRA DATABASE:						
Site/Object Name	Coordinates	Archive Status	Declaration Type	Site type	Site Reference	Site ID
Palm Tree Avenue, The Island, Upington	-28.463217 21.248977	National monument	Provincial Heritage Site	Building	9/2/032/0015	28784
Old Watermill, Upington	-28.462620 21.240514	National monument	Provincial Heritage Site	Building	9/2/032/0016	28785
Cathedral of St Augustine, Le Roux Street, Upington	-28.454859 21.246264	National monument	Provincial Heritage Site	Building	9/2/032/0017	28782
Museum Complex, 4 Schroder Street, Upington	-28.461569 21.243716	National monument	Provincial Heritage Site	Building	9/2/032/0018	28783
Dutch Reformed Church, Schroder Street, Upington	-28.454175 21.250271	National monument	Provincial Heritage Site	Building	9/2/032/0019	28779
Dakota Drive, Upington 01	-28.446639 21.227889			Artefacts, Burial Grounds & Graves	DAKOTA01	44796
Dakota Drive, Upington 02	-28.444111 21.228778			Burial Grounds & Graves	DAKOTA02	44797
Upington 08	-28.492871 21.064911			Artefacts	UP08	44977
Upington 09	-28.183889 21.768611			Burial Grounds & Graves	UP09	44980
Upington 01	-28.492270 21.515880			Artefacts	UPING01	45504
Upington 04	-28.493950 21.521720			Artefacts	UPING04	45507
Upington 06	-28.492630 21.522790			Artefacts	UPING06	45509
Upington 08	-28.480100 21.549740			Structures	UPING08	45511

HERITAGE SITES IN AND AROUND UPINGTON AREA DOCUMENTED ON THE SAHRA DATABASE:

Site/Object Name	Coordinates	Archive Status	Declaration Type	Site type	Site Reference	Site ID
Upington 02	-28.493890 21.517990			Artefacts	UPING02	45512
Upington 03	-28.494640 21.521330			Artefacts	UPING03	45513
Upington 05	-28.493410 21.521840			Artefacts	UPING05	45514
Upington 07	-28.481760 21.545030			Structures	UPING07	45515
Upington 10	-28.831389 20.808889			Burial Grounds & Graves	UPING10	45541
Upington 11	-28.183889 21.768611			Burial Grounds & Graves	UPING11	45542
Upington 12	-27.958056 22.748056			Burial Grounds & Graves	UPING12	45543
Rouxville/Upington				Artefacts	Rouxville/Upington	92832
Lambrechtsdrift, Upington				Artefacts	Lambrechtsdrift	92838
Grave and Memorial of Magrieta Jantjies, Kameelboom Cemetry, Upington	-28.474194 21.192806		Provincial Heritage Site	Burial Grounds & Graves, Monuments & Memorials	Grave of Magrieta Jantjies	130121
GKPV Upington	-28.521117 20.954179			Archaeological	GKPV01	130402
GKPV Upington	-28.511412 20.953170			Artefacts	GKPV02	130403
GKPV Upington	-28.515924 20.955140			Artefacts	GKPV03	130404
GKPV Upington	-28.513840 20.953867			Artefacts	GKPV04	130405
GKPV Upington	-28.513051 20.953550			Artefacts	GKPV05	130406
GKPV Upington	-28.514156 20.961375			Artefacts	GKPV06	130407
GKPV Upington	-28.513760 20.960974			Artefacts	GKPV07	130408
GKPV Upington	-28.515789 20.962869			Artefacts	GKPV08	130409
GKPV Upington	-28.515718 20.961037			Artefacts	GKPV09	130410
GKPV Upington	-28.513903 20.958520			Artefacts	GKPV10	130411
GKPV Upington	-28.511517 20.956258			Artefacts	GKPV11	130412
GKPV Upington	-28.521072 20.950451			Artefacts	GKPV13	130414
GKPV Upington	-28.512708 20.964360			Artefacts	GKPV14	130415
GKPV Upington	-28.518568 20.964511			Artefacts	GKPV15	130416
GKPV Upington	-28.516898 20.963062			Artefacts	GKPV16	130417
Upington 26 Monument, Paballelo Upington	-28.444669 21.222407			Monuments & Memorials	DC8/NAMM/0019	136931

HERITAGE SITES IN AND AROUND UPINGTON AREA DOCUMENTED ON THE SAHRA DATABASE:						
Site/Object Name	**Coordinates**	**Archive Status**	**Declaration Type**	**Site type**	**Site Reference**	**Site ID**
Camel Mounted Police Memorial, Saps Upington, Upington	-28.449840 21.259461			Monuments & Memorials	DC8/NAMM/0017	136946

6.1.5 Graves/Burials

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

GRAVES/BURIALS RECORDED IN 50 KM RADIUS			
HIA/AIA	SITE	COORDINATES PROXIMITY TO STUDY AREA	HERITAGE RESOURCES
Fivaz & Engelbrecht 2020c	Olyvenhouts Drift Settlement Erf 1074 (Ods1074)	28° 27' 46.3" S 21° 17' 05.3" E 8.6 km SE	Ca >1878. Several graves have stone headstones without markings. Graves are marked with stones quartz and quartzite. Adult and children's graves present.
Rossouw 2015	Near uitkomst 420 portion 5	28° 24'47.7" S 21° 21' 15.2" E 14.9 km ENE	Cemetery.
Rossouw 2015	Near uitkomst 420 portion 5	28° 24'57.7" S 21° 21' 17.14" E 14.9 km ENE	Cemetery.
Fivaz & Engelbrecht 2020b	Boegoeberg Settlement RE/48/2627	28° 33' 21.2" S 21° 44' 59.1" E 55.2 km SE	Cemetery 1960s to current.
Van Schalkwyk 2010	Vaal Koppies 40	S 28.43606 E 21.33965 13.3 km E	Large formal cemetery.
Van Schalkwyk 2010	Vaal Koppies 40	S 28.44722 E 21.33398 12.8 km ESE	Large informal cemetery.
Webley & Halkett 2014	Dyasons Klip 454	-28.53803446 21.03679572 19.9 km SW	Small rectangular patch of cobbles. Possible Cairn?
Webley & Halkett 2014	Dyasons Klip 454	-28.53768233 21.03979644 19.6 km SW	Cairn consists of 7 stones. Small, only 50cm x 60cm. Not grave.
Webley & Halkett 2014	Dyasons Klip 454	-28.54890008 21.06107893 18.8 km SW	Two small cairns.

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.

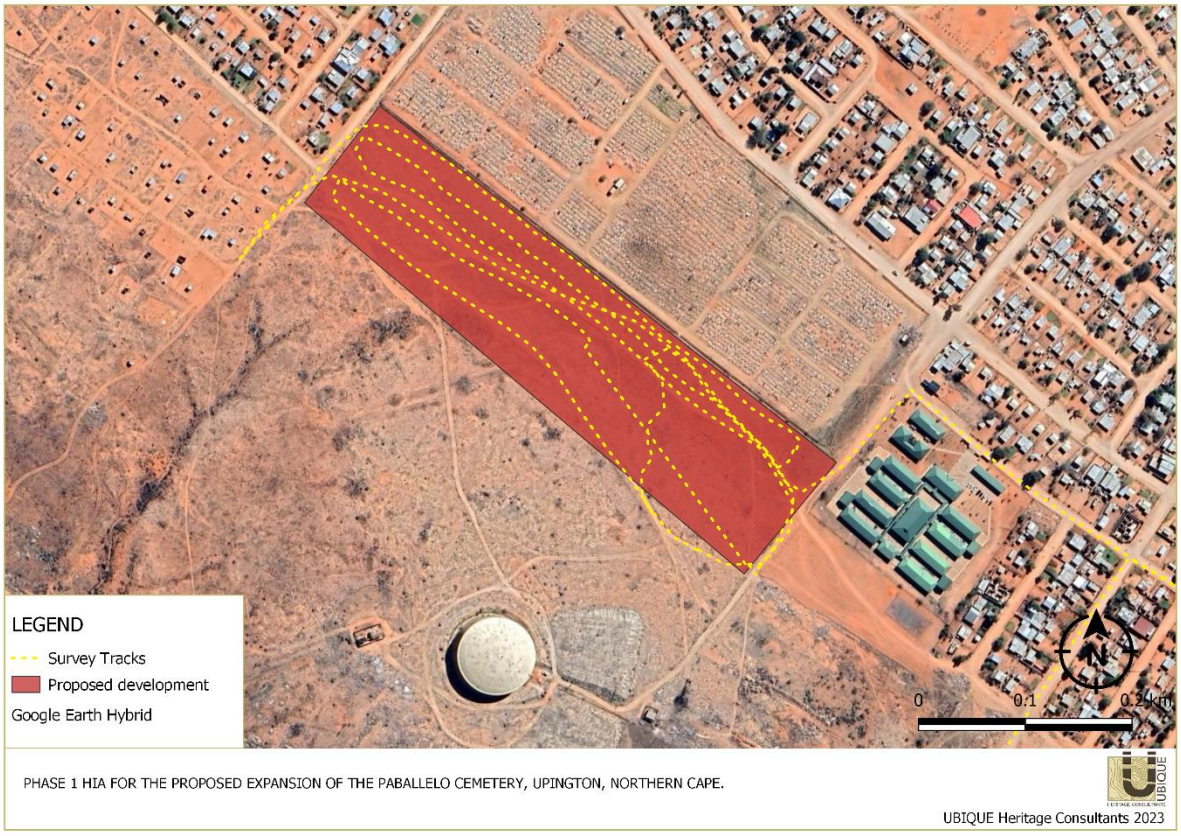


Figure 7 *Survey tracks across the development footprint.*

7.2 Description of the affected environment

The development area mainly falls within the Kalahari Karroid Shrubland vegetation type, surrounded by Gordonia Duneveld, Bushmanland Aris Grassland, and Lower Gariep alluvial vegetation. The Kalahari Karroid Shrubland landscape is generally characterised by low karroid shrubland on flat gravel plains. Kalahari Karroid Shrubland landscape is generally characterised by low karroid shrubland on flat gravel plains. Karoo-related elements (shrubs) meet here with northern floristic elements, indicating a transition to the Kalahari region and sandy soils (Mucina & Rutherford 2006). The primary geology observed on the ground surface throughout the survey

was as follows: Calcrete/Limestone, Banded Ironstone Formation (BIF), Crypto-crystalline silicates (CCS), Quartz , and Quartzite.

The dominant (primary) vegetation observed: Black Thorn Acacia/Swarthaak (*Acacia mellifera*), Camelthorn Tree/Kameeldoringboom (*Acacia erioloba*), Tall Bushmangrass/Lanbeen Boesmangras (*Stipagrostis ciliate*), Silky Bushmangrass/Blinkblaar Boesmangras (*Stipagrostis uniplumis*), Krulblaargras (*Eragrostis biflora*), Prosopis Tree (*Prosopis glandulosa*), Kraalbos (*Galenia Africana*). However, the proposed development footprint does not have a lot of vegetation, likely due to the disturbed nature of the site.

The terrain is characterised by flat sandy plain combined with klipveld patches. Two-track roads as well as pedestrian tracks were observed. The proposed development footprint has been polluted with domestic refuse, specifically in the eastern section. The survey revealed that the area has been disturbed throughout the site, these disturbances are believed to have been due to construction machinery.

An existing cemetery is located North and East of the proposed development, a residential area can also be found east of the proposed development area, while an open field is located by the southern and western boundaries, as well as a municipal servitude in the south.

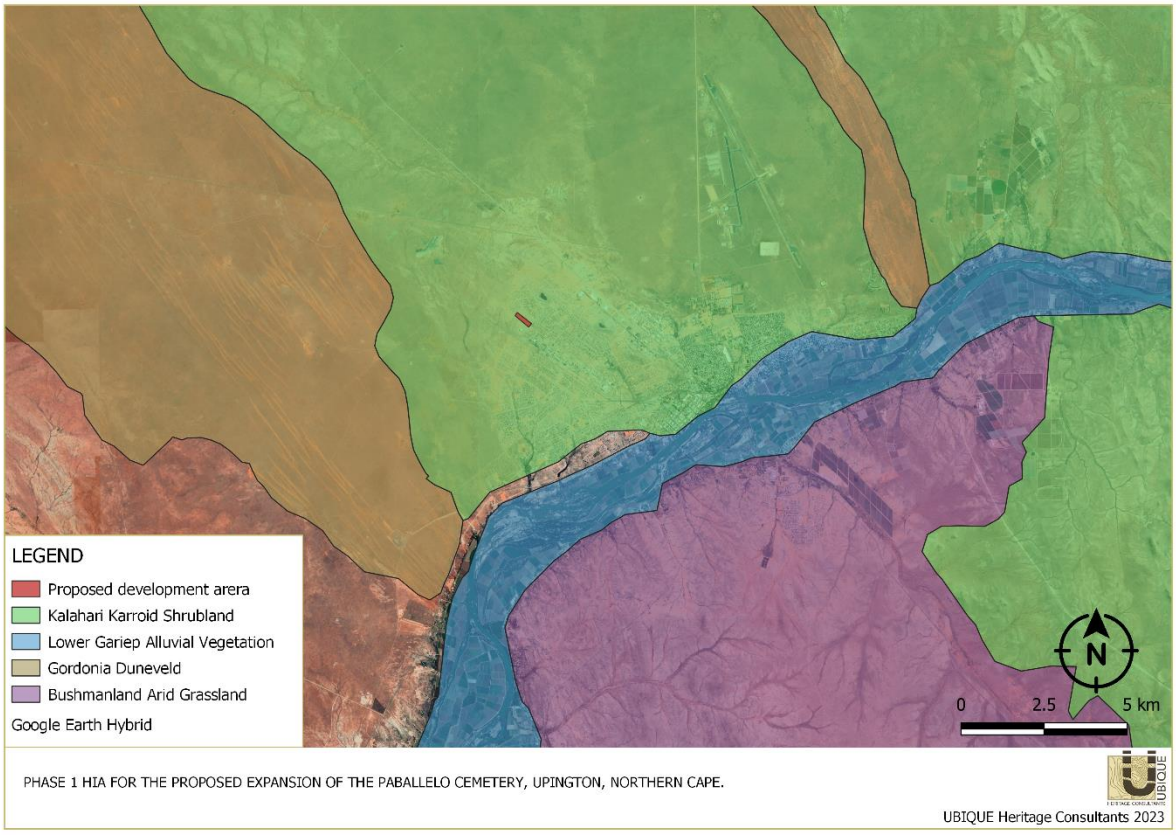


Figure 8 *Indication of the vegetation types in and around the study area (namely Bushmanland Arid Grassland Vegetation, Gordonia Duneveld, Kalahari Karroid Shrubland, and Lower Gariep Alluvial Vegetation).*

Figure 9 *Views of the affected development area.*

7.3 Identified heritage resources

7.3.1 Stone Age Identified

STONE AGE RESOURCES IDENTIFIED					
SITE ID #	DESCRIPTION		PERIOD	LOCATION	FIELD RATING/ SIGNIFICANCE/ RECOMMENDED MITIGATION
PBL-001	Type lithic/s	MSA retouched flakes and chunk	MSA	28° 26' 10.1" S 21° 12' 07.8" E	Field Rating IV C Low significance No Mitigation Required
	Raw material	BIF			
	N in m².	2/500m²			
	Context	No context. Scattered			
	Additional	Located close to previously disturbed ground			
PBL-002	Type lithic/s	MSA retouched flakes and chunk	MSA	28° 26' 12.1" S 21° 12' 06.9" E	Field Rating IV C Low significance No Mitigation Required
	Raw material	BIF			
	N in m².	3/100m²			
	Context	No context. Scattered			
	Additional	Located close to previously disturbed ground			

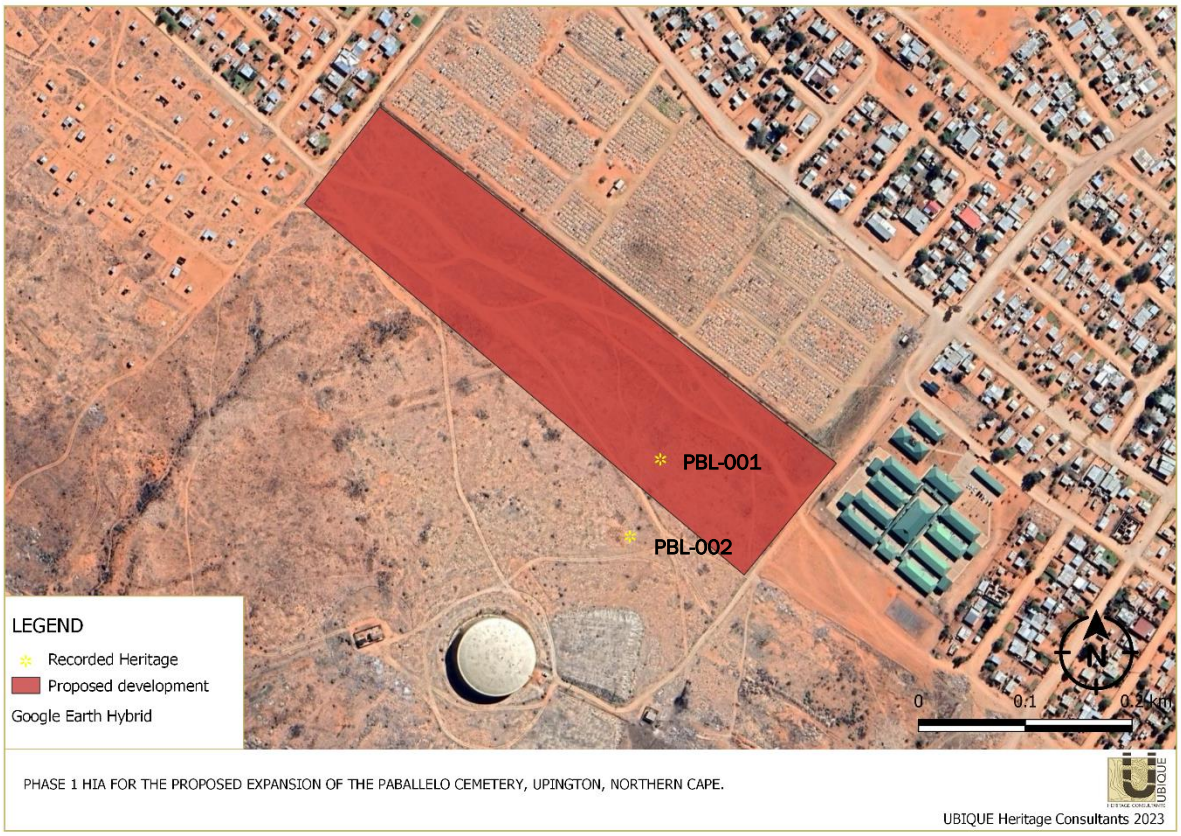


Figure 10 *Distribution of identified heritage resources at the proposed development area.*

7.4 Discussion

7.4.1 Archaeological features

7.4.1.1 Prehistorical

Two occurrences of Stone Age materials were recorded. The low-density surface scatters included flakes and chunks.

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 'General' Protection C (Field Rating IV C). This means that it has been sufficiently recorded (in Phase 1). It requires no further action.

Figure 11 *The lithic material recorded within and near the proposed development area.*

7.4.2 Palaeontological resources

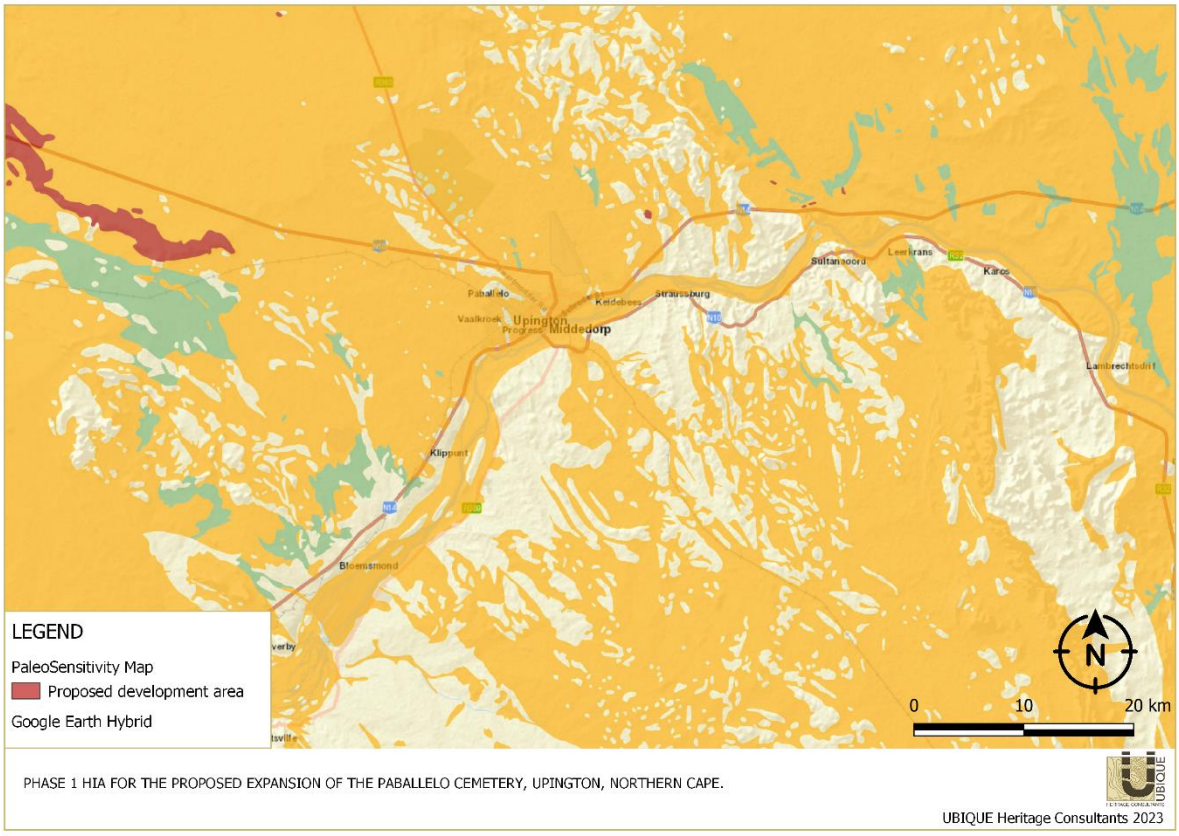


Figure 12 *The Heritage Paleo screening tool and SAHRIS PalaeoSensitivity Map, indicating High (red), Medium (yellow), and Low (green) palaeontological significance in the study area, (https://screening.environment.gov.za/ ; https://sahris.sahra.org.za/map/palaeo).*

The proposed development area is primarily underlain by the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). These rocks are approximately one to two billion years old and entirely unfossiliferous (Butler 2023 Appendix A).

Elize Butler from Banzai Environmental conducted a palaeontological field assessment for the development footprint (see Appendix A).

8. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

Description	Development Impact		Mitigation	Field rating/ Significance
Archaeological				
1. The two occurrences of MSA surface scatters across the development footprint.	Nature	Neutral	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				
2. The Palaeontological Sensitivity of the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). These rocks are approximately one to two billion years old and entirely unfossiliferous (Butler 2023 Appendix A). Therefore, an overall low palaeontological sensitivity is allocated to the development footprint.	Nature	Neutral	No mitigation required.	N/A
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		

The impact on the MSA lithic occurrences recorded at sites PBL-001 and 002 are not conservation worthy, and therefore, the impact is negligible.

Regarding the impact on palaeontological resources, the sediments are unfossiliferous. This indicates that the impact of the development footprint will be of low significance in palaeontological terms. Therefore, it is considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological reserves of the area (Butler 2023).

9. RECOMMENDATIONS

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

1. The two MSA lithic occurrences recorded in and near the development footprint have been sufficiently recorded. The MSA cultural material identified is not conservation worthy. No further mitigation is recommended concerning these resources. Therefore, from a heritage point of view, we recommend that the proposed development can continue.

2. The existing cemetery is of importance, and the developer should take note of any historical graves. However, these graves were not located within the proposed development.

3. The development footprint is underlain by the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). A low Palaeontological Significance has been allocated to the proposed development as the Palaeontological Sensitivity of the Gordonia Formation is low, while that of the ancient Precambrian basement rocks are zero. These rocks are approximately one to two billion years old and entirely unfossiliferous. 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. It is considered that the development of the proposed development is deemed appropriate and will not lead to detrimental impacts on the palaeontological resources of the area (Butler 2023).

4. Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490) must be alerted immediately as per section 36(6) of the NHRA. Depending on the nature of the finds, a professional archaeologist or palaeontologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources 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

This HIA has identified no significant heritage resources that will be impacted negatively by development. The existing cemetery is not within the proposed development area, and the two lithic occurrences are without context and considered to be of low significance. Therefore, the proposed expansion and upgrade of the Paballelo Jupiter cemetery, Upington, in the ZF Mgcawu District Municipality and within the Dawid Kruiper Local Municipality in the Northern Cape Province, may continue, provided the recommendations stipulated within this report, and the subsequent decision by SARHA, are followed.

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APPENDIX A

PALAEONTOLOGICAL DESKTOP ASSESSMENT: PROPOSED PABALLELO JUPITER CEMETERY EXPANSION IN UPINGTON, NORTHERN CAPE PROVINCE

BANZAI ENVIRONMENTAL

PALAEONTOLOGICAL DESKTOP ASSESSMENT

PROPOSED PABALLELO JUPITER CEMETERY EXPANSION IN UPINGTON, NORTHERN CAPE PROVINCE

March 2023

COMPILED FOR:

UBIQUE HERITAGE CONSULTANTS

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

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

Disclosure of Vested Interest

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

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

Tel: +27 844478759

Email: 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: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).

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

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).

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 be applied to	Section 3 compliance with SAHRA guidelines

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
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 Paballelo Jupiter cemetery expansion in Upington, 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 and to mitigate possible damage to fossil resources.

The development footprint is underlain by the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). A low Palaeontological Significance has been allocated to the proposed development as the Palaeontological Sensitivity of the Gordonia Formation is low, while that of the ancient Precambrian basement rocks are zero. These rocks are approximately one to two billion years old and entirely unfossiliferous. 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. It is considered that the development of the proposed development is deemed appropriate and will not lead to detrimental impacts on the palaeontological resources of the area.

If fossil remains are discovered during any phase of construction, either on the surface or below, the ECO in charge of these developments must be alerted immediately. These discoveries should be protected (if possible, *in situ*) and the ECO must report to SAHRA so that appropriate mitigation can be carried out by a professional palaeontologist. SAHRA Contact details: South African Heritage Resources Agency, 111 Harrington Street, PO Box 4637, Cape Town 8000, South Africa. Email: Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509 Web: www.sahra.org.za)

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

Impact Summary

	Site	Probability	Duration	Magnitude	Reversibility	Irreplicable Loss	Cumulative Effect	Significance
	1	2	4	1	4	4	2	17

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1 INTRODUCTION

The Dawid Kruiper Municipality plans to expand the Paballelo Jupiter cemetery on Erf 5530 in Upington, in the Northern Cape Province (Figure 1-2). The proposed cemetery expansion will be 20 000m^2 in extent and will be located adjacent to the current cemetery. EnviroAfrica cc has been appointed to manage the Environmental Impact Assessment (EIA) for the proposed cemetery expansion. UBIQUE Heritage Consultants was appointed to conduct the Archaeological Impact Assessment (AIA), while Banzai Environmental was employed to conduct the Palaeontological Desktop Assessment (PDA) as part of the Heritage Impact Assessment (HIA).

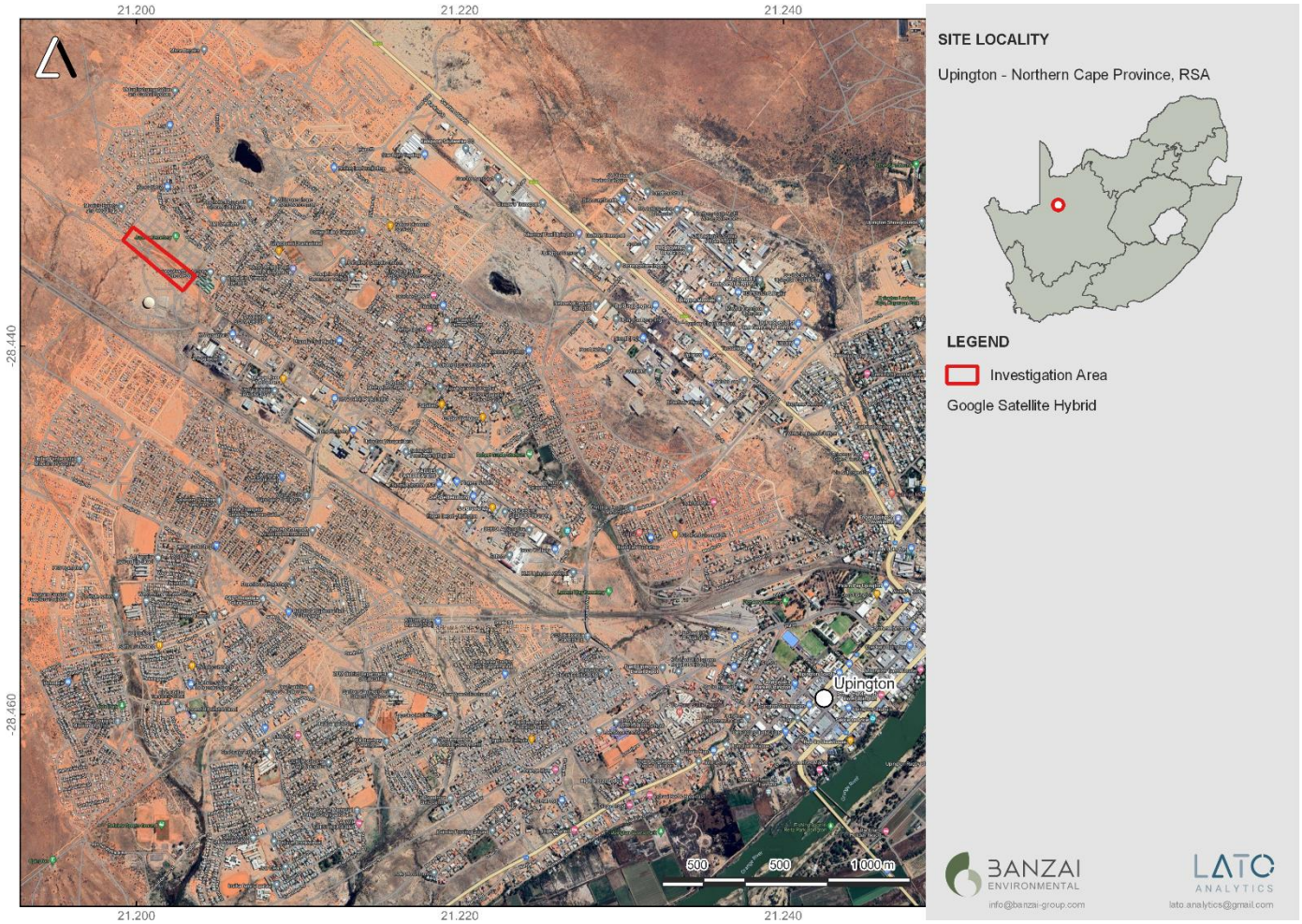


***Figure 13**:Regional locality of the proposed Paballelo Jupiter cemetery expansion on Erf 5530 in Upington, in the Northern Cape Province.*

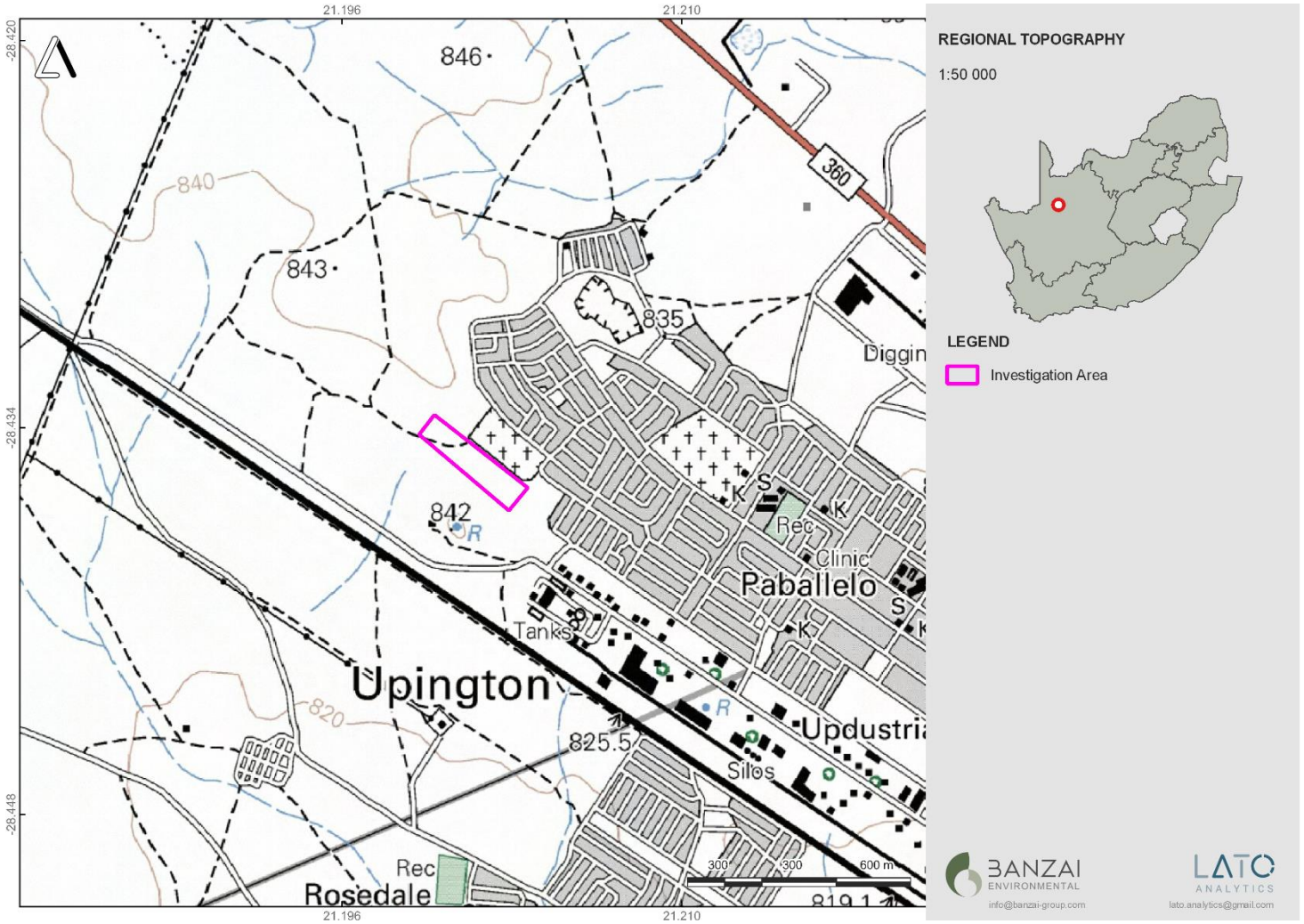


***Figure 14**: Locality Map of of the proposed Paballelo cemetery expansion on Erf 5530 in Upington, in the Northern Cape Province.*

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This present study has been conducted by Mrs Elize Butler. She has conducted approximately 400 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.

3 LEGISLATION

4 National Heritage Resources Act (25 of 1999)

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

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 m^2 in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- 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.

5 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).

6 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed cemetery expansion in Upington the Northern Cape is depicted on the 1:250 000 Upington 2822 (1998) Geological map (Council of Geoscience, Pretoria) (Figure 3; Table 2). This map indicates that the proposed development is underlain by the Gordonia Formation of the Kalahari Group (Qg, white with yellow dashes) as well as the Jannelsepan Formation (Mj, blue) of the Areachap Terrane (Namaqua-Natal Province, Namaqua Sector). Updated geology of the area is depicted in Figure 4 and indicates that the proposed development in underlain by the Kalahari Group and the Jannelsepan Formation. The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Gordonia Formations is moderate (green) while that of the Jannelsepan Formation (Mj, blue) of the Areachap Terrane is Zero (grey) (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 has a Moderate Paleontologically Sensitivity. These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods, and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn corns as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which includes termite and

insect's burrows and mammalian trackways. Amphibian and crocodile skeletons have been uncovered where the depositional settings in the past were wetter. The Quaternary deposits are very important because palaeoclimatic changes are reflected in the different geological formations (Hunter et al., 2006). During the climate fluctuations in the Cenozoic Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Cenozoic but states that climatic changes during the Quaternary Period, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the Quaternary Period were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth et al., 2004).

The Kalahari Group overlies the Namaqua-Natal Province basement rocks. The latter consists of tectono-stratigraphic terranes assembled during the Namaqua Orogeny. The three main lithostratigraphic components (Cornell et al, 2006) include

- reworked Kheisian rocks (late Palaeoproterozoic) that are about 2000 Ma old,
- juvenile supracrustal and plutonic rocks formed about 1600 to 1200 Ma and assembled during collision events that were accompanied by metamorphism and deformation
- between 1200 and 1000 Ma voluminous syn- and post-tectonic granitoids formed.

The Areachap Terrane comprise of 1000 Ma granitoids (Keimoes Suite) as well as a juvenile NNW-trending belt of about 1300 Ma arc-related supracrustal rocks. The latter comprise of amphibolite-grade metabasic and intermediate supracrustal gneisses of the Areachap Group.

The northern portion of the Areachap Group is dominated by the Jannelsepan Formation comprising of calcsilicate and migmatitic amphibolite Rocks. These rocks are banded and massive. The massive hornblende-plagioclase amphibolites are understood to be metamorphosed dolerite

and basaltic lava, while the banded amphibolites have pale-green layers containing calc-silicate assemblages that includes diopside, epidote plagioclase, and seldom grossular. These rocks are about two to one billion years old and are unfossiliferous (Almond and Pether, 2008

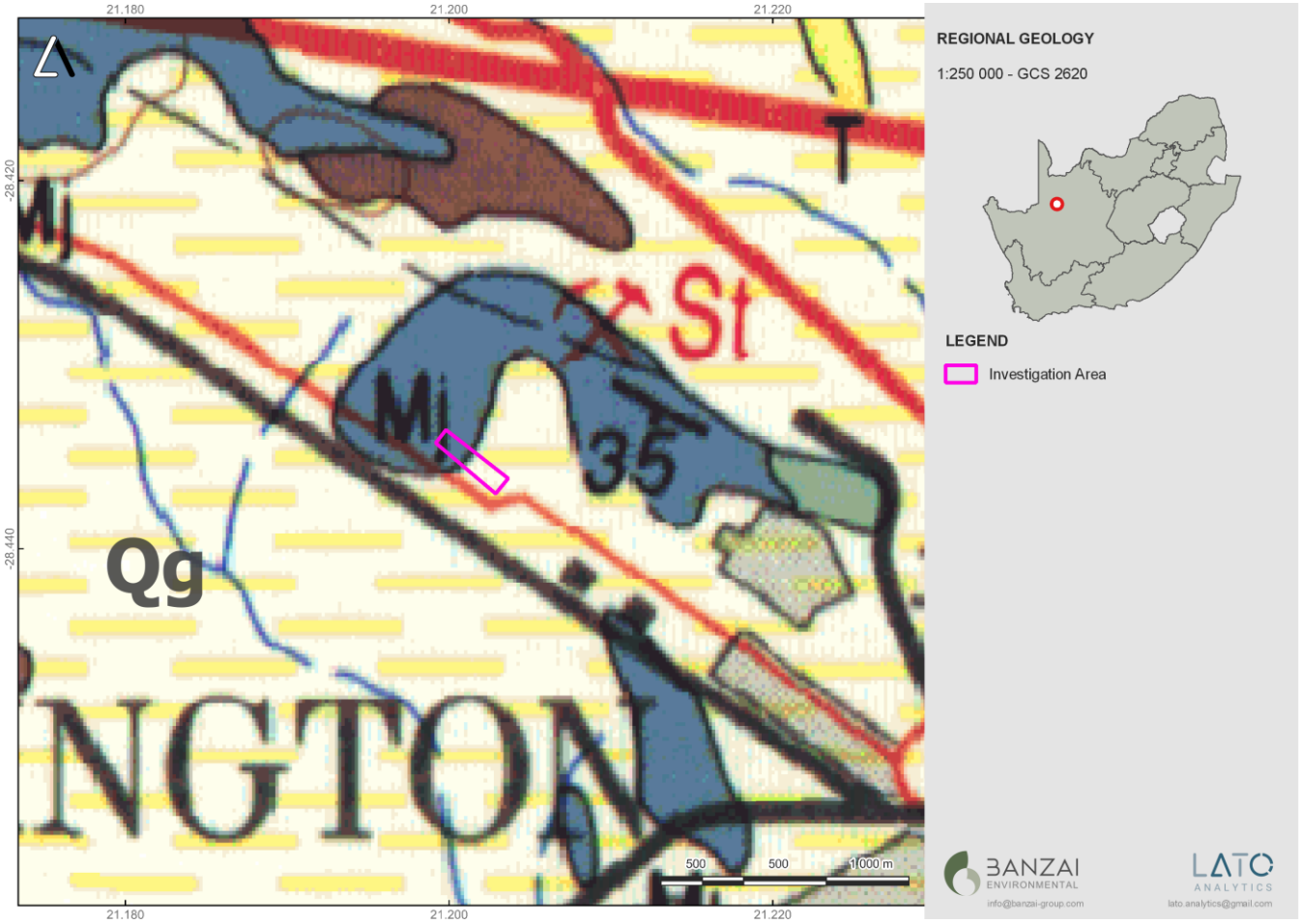
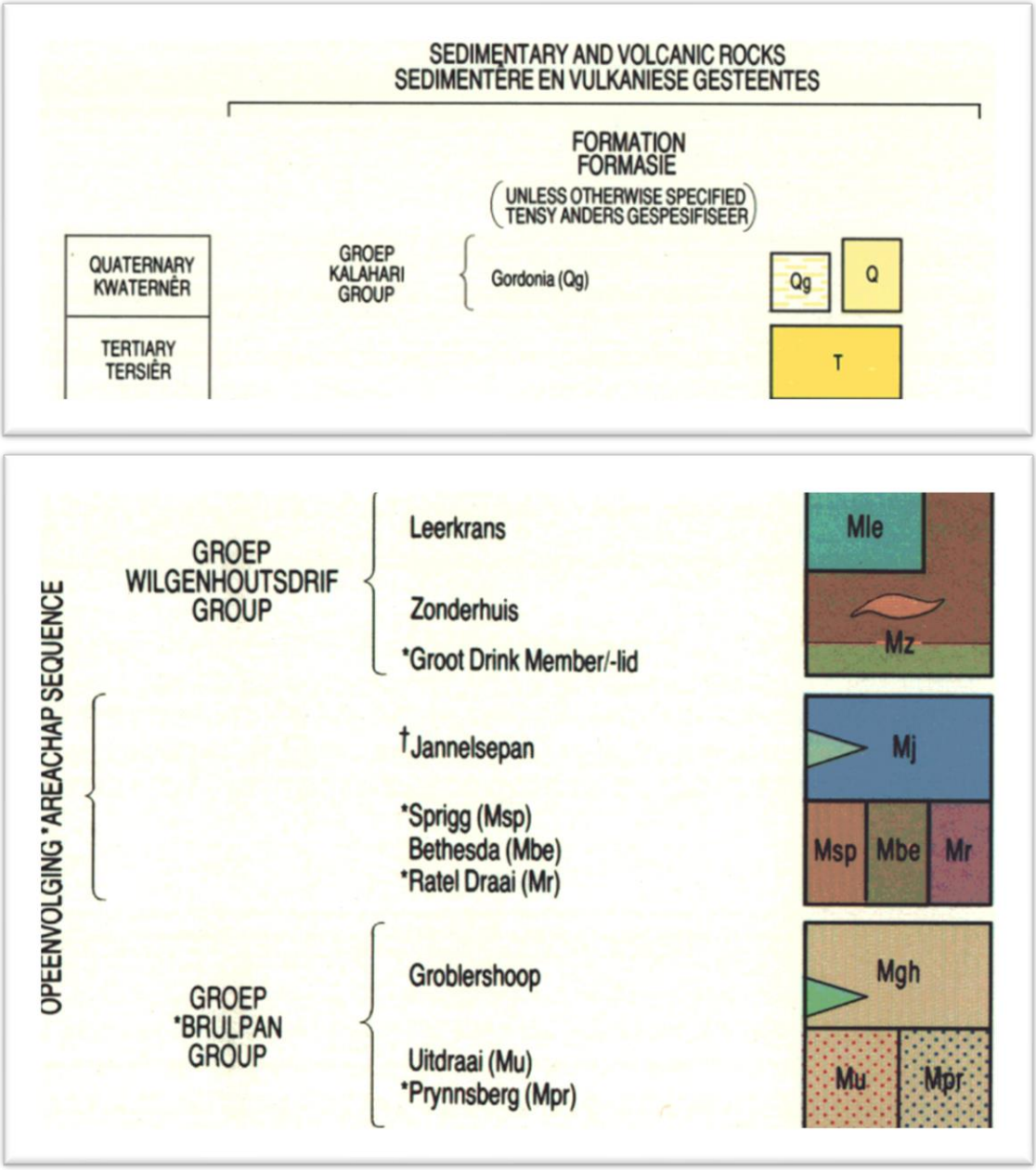


***Figure 15**: Extract of the 1:250 000 Upington 2620 (1998) Geological map (Council of Geoscience, Pretoria) indicating the surface geology of the proposed development, underlain by the Gordonia Formation of the Kalahari Group (Qg, stippled yellow) as well as metasediments of the Areachap Sequence.*

Table 2:Legend of the 1:250 000 Upington 2820 Geological map (1998) Geological map (Council of Geoscience, Pretoria).



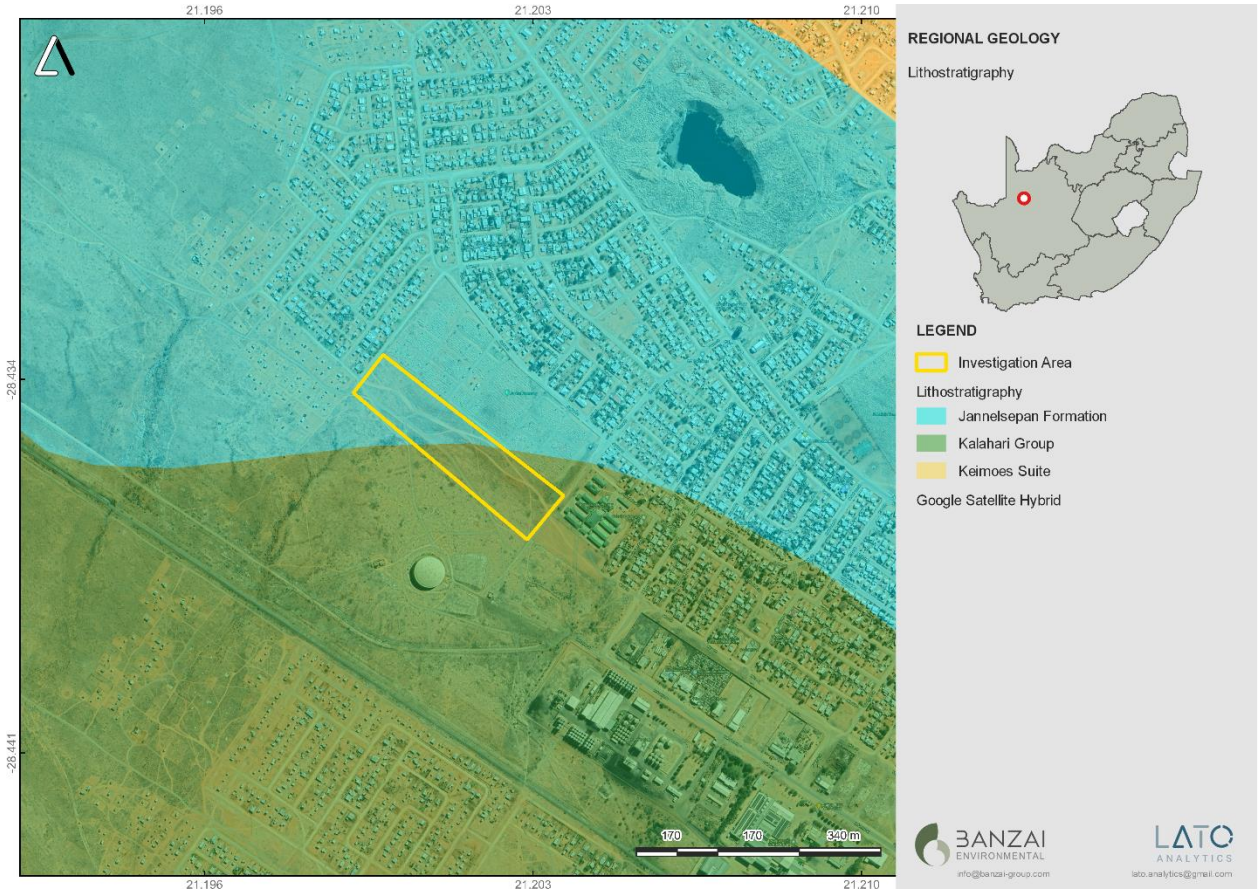


***Figure 16**: Updated geology of the proposed development indicated that the proposed development is underlain by the Janelsepan of the Namaqua Natal Province as well as the Kalahari Group.*

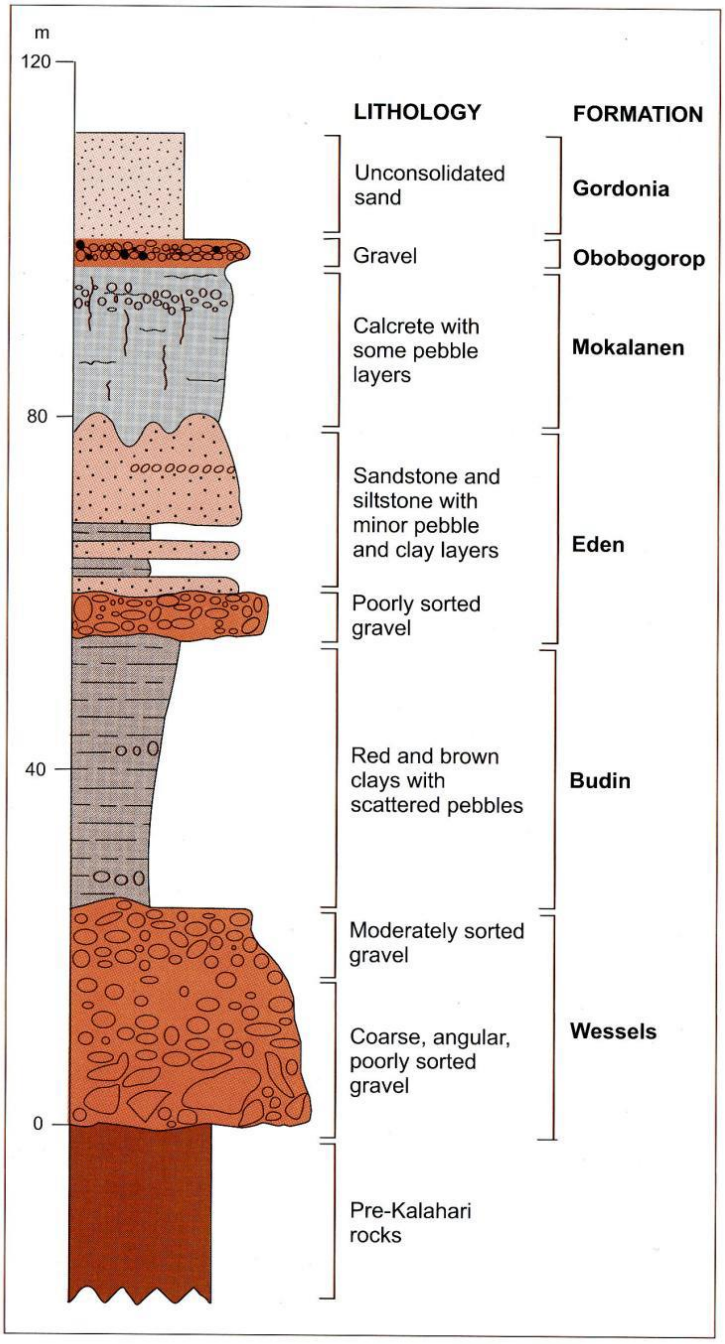


***Figure 17**: Stratigraphy of the Kalahari Group (Image taken from Partridge* et al.*, 2006). Calcretes and aeolian sands of the Gordonia Formation possibly corresponds to the Mokalanen Formation*

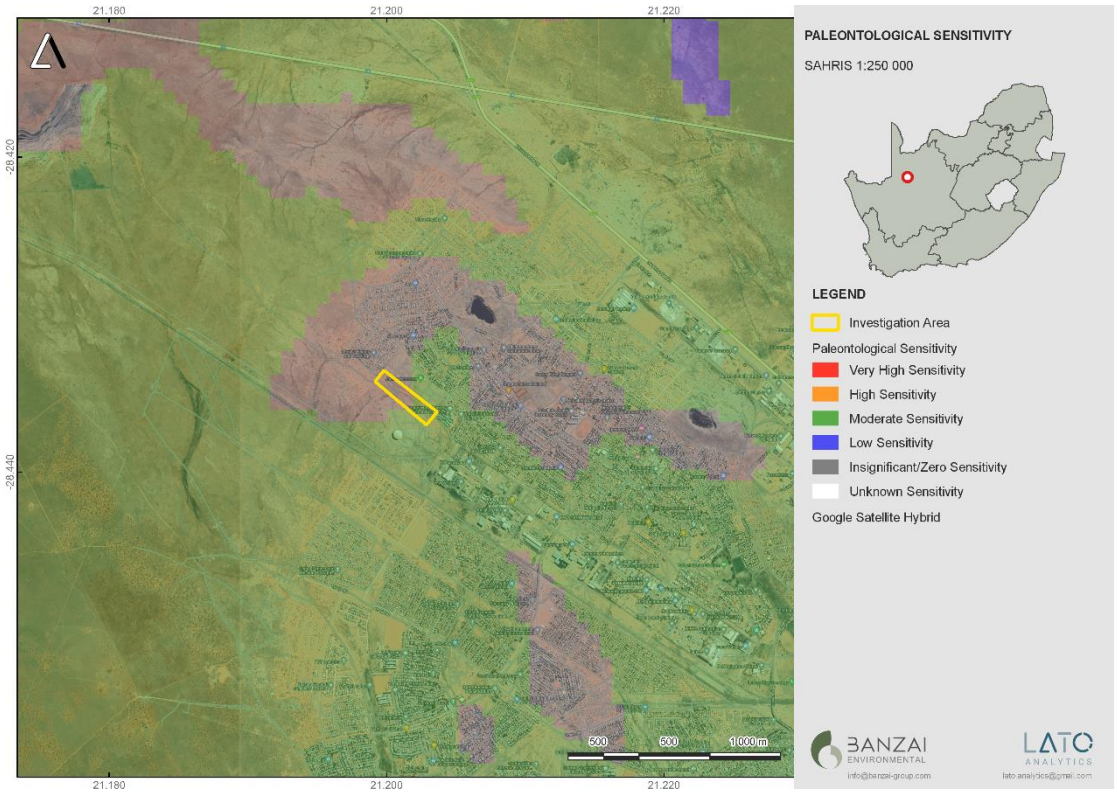


***Figure 18**: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed development in yellow.*

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

7 GEOGRAPHICAL LOCATION OF THE SITE

It is proposed Paballelo Jupiter Cemetry is located south of the N10 on the westerns side of Upington (**Figure 1-2**).

Table 4: GPS coordinates

	Latitude	Longitude
Northern Border	28°26'0.74"S	21°11'59.29"E
Eastern Border	28°26'10.27"S	21°12'13.13"E
Southern Border	28°26'13.19"S	21°12'10.35"E
Western Border	28°26'3.38"S	21°11'57.04"E

8 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.

9 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 is 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 is used it is generally **assumed** that exposed fossil heritage is present within the footprint.

10 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 Upington 2820 (1988 (Council of Geoscience, Pretoria)
- A Google Earth map with polygons of the proposed development was obtained from EnviroAfrica cc.

11 IMPACT ASSESSMENT METHODOLOGY

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

- Construction;
- Operation; and
- Decommissioning.

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

The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 5: The Rating System

NATURE		
The Nature of the Impact is the possible destruction of fossil heritage		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		

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

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		

This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (**Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.

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

Table 6: Summary of Impact Tables

	Site	Probability	Duration	Magnitude	Reversibility	Irreplicable Loss	Cumulative Effect	Significance
	1	2	4	1	4	4	2	17

12 Summary of Impact Tables

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

13 FINDINGS AND RECOMMENDATIONS

The development footprint is underlain by the ancient Precambrian basement rocks of the Namaqua-Natal Province, mantled by sediments of the Gordonia Formation (Kalahari Group). A low Palaeontological Significance has been allocated to the proposed development as the Palaeontological Sensitivity of the Gordonia Formation is low, while that of the ancient Precambrian basement rocks are zero. These rocks are approximately one to two billion years old and entirely unfossiliferous. 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. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

If fossil remains are discovered during any phase of construction, either on the surface or below, the ECO in charge of these developments must be alerted immediately. These discoveries should be protected (if possible, *in situ*) and the ECO must report to SAHRA so that appropriate mitigation can be carried out by a professional palaeontologist. SAHRA Contact details: South African Heritage Resources Agency, 111 Harrington Street, PO Box 4637, Cape Town 8000, South Africa. Email: Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509 Web: www.sahra.org.za)

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

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Appendix 2 Curriculum Vitae

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

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

MEMBERSHIP
Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

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

Principal Research Assistant	National Museum, Bloemfontein
and Collection Manager	1998–2022

TECHNICAL REPORTS

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

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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 construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape Province. Savannah South Africa. Bloemfontein.

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

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

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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.

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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.

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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.

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

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