



## PHASE 1 HERITAGE DESKTOP STUDY REPORT GROOTFONTEIN RE/1/394 JR, GAUTENG PROVINCE

PHASE 1 HIA DESKTOP STUDY REPORT FOR THE PROPOSED CONSTRUCTION OF  
RESIDENTIAL UNITS, SCHOOLS AND BUSINESS FACILITIES, GROOTFONTEIN RE/1/394  
JR, GAUTENG PROVINCE, CITY OF TSHWANE, GAUTENG PROVINCE.

**PREPARED FOR:**  
GKM ENVIRONMENTAL

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

21 JULY 2023

**Web:** [www.ubiquecrm.com](http://www.ubiquecrm.com)

**Mail:** [info@ubiquecrm.com](mailto:info@ubiquecrm.com)

CSD Supplier Number MAAA0586123

<b>CLIENT:</b>	GKM Environmental
<b>CONTACT PERSON:</b>	<b>Grace Magaya</b> E-mail: grace@gkmenvironmental.co.za
<b>HERITAGE CONSULTANT:</b>	<b>UBIQUE Heritage Consultants</b> www.ubiquecrm.com info@ubiquecrm.com
<b>CONTACT PERSON:</b>	<p><b>Sky-Lee Fairhurst</b> (archaeologist) Member of the Association of Southern African Professional Archaeologists: Member number: 541 Email: sky@ubiquecrm.com</p> <p><b>Heidi Fivaz</b> (archaeologist) Member of the Association of Southern African Professional Archaeologists: Member number: 433 Email: heidi@ubiquecrm.com</p> <p><b>Jan Engelbrecht</b> (archaeologist and lead CRM specialist) Member of the Association of Southern African Professional Archaeologists: Member number: 297 Email: jan@ubiquecrm.com</p>

**Declaration of independence:**

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

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

Signed:

J.A.C. Engelbrecht, H. Fivaz & S. Fairhurst  
UBIQUE Heritage Consultants

Date: 2023-07-21

Copyright: This report is confidential and intended solely for the use of the individual or entity to whom it is addressed or to whom it was meant to be addressed. It is provided solely for the purposes set out in it and may not, in whole or in part, be used for any other purpose or by a third party without the author's prior written consent.

## SUMMARY OF SPECIALIST EXPERTISE

### SKY-LEE FAIRHURST

CRM ARCHAEOLOGIST &  
ARCHAEOLOGICAL ILLUSTRATOR

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

### HEIDI FIVAZ

CRM ARCHAEOLOGIST &  
OBJECT CONSERVATOR

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

### JAN ENGELBRECHT

CRM ARCHAEOLOGIST

Jan Engelbrecht is accredited by the Cultural Resources Management section of the Association of Southern African Professional Archaeologists (ASAPA) to undertake Phase 1 AIAs and HIAs in South Africa. He is also a member of the Association for Professional Archaeologists (ASAPA). Mr Engelbrecht holds an honours degree in archaeology (specialising in the history of early farmers in southern Africa (Iron Age) and the Colonial period) from the University of South Africa. He has 12 years of experience in heritage management. He has worked on projects as diverse as the Zulti South HIA of Richards Bay Minerals, research on the David Bruce heritage site at Ubombo in Kwa-Zulu Natal, and various archaeological excavations and historical, archaeological projects. He has worked with many rural communities to establish integrated heritage and land use plans and speaks Zulu fluently. Mr Engelbrecht established Ubiqum 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 GKM Environmental as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA) to conduct an archaeological desktop assessment to determine the potential impact of the proposed construction of residential units, schools and business facilities, Grootfontein RE/1/394 JR, Gauteng Province, City of Tshwane, Gauteng Province, on any possible sites, features, or objects of cultural heritage significance.

### Findings of Archaeological Desktop and Probable Impact on Heritage Resources

The Desktop Report revealed that several sites and areas had been extensively studied in the region. The Gauteng province and Pretoria area have a long and varied history. The HIA Desktop Report has found that no Heritage or Archaeological Impact Assessments have been undertaken directly within the proposed development area. However, several have been done adjacent and on other portions of the proposed development footprint.

Heritage sites and resources ranging from low to high significance have been documented on the periphery of a 5-150 km radius from the study area. These sites provide the data necessary to anticipate the heritage resources and probable significance accompanying any projected heritage resource.

Although the Desktop Scoping Report has revealed that archaeological resources have been identified in the wider area, some have small sample sizes, are without context, and are often of low significance. Numerous impact assessments have been conducted on the broader region. It should be mentioned that according to the topographic maps, as well as Google Earth satellite imaging, the majority of the proposed development footprint has been disturbed by agricultural activities. Therefore, it is considered that the presence of any archaeological resources relating to the Stone Age, Iron Age and historic/colonial that would be present on the surface would likely be out of context.

Lithic material has been reported in the wider region dating to the ESA, MSA and LSA. The significance ranges between low, medium and high significance. The possibility of open-air Stone Age sites/occurrences of medium to high significance in the development area is considered to be low due to the lack of such sites reported within the vicinity and the disturbed nature of the majority of the proposed development area. It is considered that if such sites are identified, they would be out of context. **Therefore, the significance of such sites found within the proposed development areas would be low.**



Rock art has been recorded in the wider region. However, little to no sites have been recorded near the proposed development areas. **The probability of such sites being located in the development areas is considered unlikely.**

The desktop scoping report revealed that numerous Iron Age sites are present in the general area, one of which has been recorded approximately 4 km north of the proposed development. Such sites are often associated with the Tswana and Ndebele speakers. Many of these sites have a medium to high significance. However, it is **improbable that such sites will be present in the proposed development area** due to farming activities.

The desktop study revealed that the region has a vast history, especially regarding the Historical/colonial period. Numerous settlements, structures, monuments, memorials, and battlefields have been identified in the region (most of which can be found on the SAHRA database). However, few consulted impact assessments reported on historical/colonial period resources. **The probability of cultural resources relating to this period being present in the proposed development areas is low.**

Graves and informal cemeteries can be expected anywhere in the landscape; thus, the possibility of any graves within the development footprint should not be ignored. **The probability of graves and burials being present is low.** However, the **likelihood of subsurface graves and burials should not be disregarded** since graves and informal cemeteries can be expected anywhere in the landscape. For example, family cemeteries can be anticipated close to farmsteads, while informally marked graves containing fieldstone cairns and headstones may be found in the veldt.

The proposed development area on the potentially fossiliferous Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) that might preserve trace fossils such as stromatolites or microbialites. The soils and sands of the Quaternary period would not preserve fossils. The potentially fossiliferous section in the southwest corner, on the Malmani Subgroup, is under agriculture and has been cleared of rocks. Therefore, it is considered extremely unlikely that any fossils would still occur there any longer (Bamford 2023 Appendix B).

## Recommendations

This scoping study has revealed that various heritage sites occur in the wider region. Every site is relevant to the Heritage Landscape. These recommendations are based on studies undertaken in the broader area of the proposed development. The following conclusions apply:

1. The scoping report has revealed several Stone Age occurrences/sites have been recorded in the wider region. However, no Stone Age resources have been identified near the proposed development. **The possibility of open-air Stone Age sites/occurrences in the development area is considered improbable.** However,

suppose archaeological/heritage occurrences are present, such occurrences are expected to be of **low significance, out of context** and thus Non-Conservation Worthy (NCW) based on evidence from the surrounding landscape and agricultural activities and surface disturbance.

2. Rock art has been reported in the wider region. However, no rock art has been identified within the immediate vicinity of the proposed development areas. **The probability of rock art being present on site is very low.**
3. Although numerous Iron Age sites have been recorded in the wider region, it is considered that the **presence of such sites in the proposed development would be improbable.** This conclusion is based on the fact that the property, Grootfontein RE/1/394, has been disturbed by agricultural activities. In the unlikely event surface material is present, they are expected to be out of context and, therefore, **of low significance.**
4. The presence of **cultural material relating to the historical/colonial period is considered to be low.** If such above-ground material is present, we believe it may be out of context due to the disturbed nature of the proposed development.
5. Formal and informal graveyards, as well as pre-colonial graves, occur widely across southern Africa. It is commonly recommended that these sites are preserved from development. Any graveyard(s), grave(s) or burial(s) found close to the proposed development footprint would likely be of High Local Significance. It is recommended that they are fenced off with the inclusion of a 50 m buffer/safety zone. We recommend the appointment of an on-site heritage officer during the development to monitor the safety of the graves during construction.
6. Should it be impossible to avoid graveyard(s), grave(s) or burial(s) sites during development, mitigation in the form of grave relocation could be undertaken. This is, however, a lengthy and costly process. Grave relocation specialists should be employed to manage the liaison process with the communities and individuals who, by tradition or familial association, might have an interest in these graves or burial grounds, as well as manage the permit acquisition from the SAHRA Burial Grounds and Graves (BGG) Unit and the arrangements for the exhumation and re-interment of the contents of the graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.
7. Limitations of this Desktop Scoping report are determined by the amount of information available on the South African Heritage Resources Information System (SAHRIS) and the clarity of satellite imaging. **Sub-surface archaeological sites, graves and informal cemeteries could be directly impacted during the proposed development.**

8. This scoping report estimates the probability of heritage sites/artefacts located on/near the development footprint based on available data. Due to the lack of heritage resources recorded near the proposed development areas and the current nature of human activity, the likelihood of archaeological sites/occurrences in the development area is considered improbable. We have, however, developed **a visual guide or rudimentary Chance Finds Protocol for this project (APPENDIX A). It is recommended that the developer refers to it during development.** We recommend exempting the project from a complete AIA study with field assessment. This is, however, subject to agreement by the South African Heritage Resources Agency.
  
9. This scoping report reflects the specialists' estimation of the likely impacts that may occur on said resources by the proposed development. The extent and significance of identified probable resources are unknown. **The final decision on whether the submission of a full impact assessment is required lies with the responsible heritage resources authorities, the South African Heritage Resources Agency (SAHRA) if there is reason to believe that** heritage resources will be affected by construction activities and events.
  
10. Hidden or sub-surface sites may exist in the area. No sub-surface testing may be conducted without a permit, and therefore sites may be missed during the field assessment. We recommend that if 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 uncovered during mining, 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 discovered, 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. A professional archaeologist or palaeontologist must be contracted as soon as possible to inspect the findings. If the newly unearthed heritage resources are of high significance, a Phase 2 rescue operation may be required with permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.
  
11. The Palaeontological Impact Assessment indicates that the proposed site lies on the potentially fossiliferous Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) that might preserve trace fossils such as stromatolites or microbialites. It is therefore recommended that:
  - **a Fossil Chance Find Protocol should be added to the EMPr.**
  - Based on this information, it is recommended that **no further palaeontological impact assessment is required** unless fossils are found by the contractor, environmental officer or other designated responsible person once excavations for foundations, infrastructure and amenities have commenced. Since the **impact will be low, the project should be authorised as far as palaeontology is concerned.**

## TABLE OF CONTENTS

SUMMARY OF SPECIALIST EXPERTISE .....	iii
EXECUTIVE SUMMARY .....	iv
Project description .....	iv
Findings of Archaeological Desktop and Probable Impact on Heritage Resources.....	iv
Recommendations.....	v
TABLE OF FIGURES .....	ix
ABBREVIATIONS .....	x
GLOSSARY .....	x
1. INTRODUCTION.....	1
1.1 Scope of study.....	1
1.2 Assumptions and limitations.....	2
2. TERMS OF REFERENCE .....	3
2.1 Statutory Requirements .....	3
2.1.1 General .....	3
2.1.2 National Heritage Resources Act 25 of 1999 .....	3
2.1.3 Heritage Impact Assessments/Archaeological Impact Assessments.....	3
2.1.4 Management of Graves and Burial Grounds.....	4
3. STUDY APPROACH AND METHODOLOGY.....	6
3.1 Desktop study .....	6
3.1.1 Literature review.....	6
3.1.2 Definitions of heritage resources.....	6
3.2 Determining significance.....	7
3.2.1 Assessment of development impacts.....	8
3.3 Report.....	10
4. PROJECT OVERVIEW.....	11
4.1 Technical information .....	11
5. DESCRIPTION OF AFFECTED ENVIRONMENT .....	15
6. HERITAGE SENSITIVITY .....	16
6.1 Historical and archaeological background of the general area .....	16
6.2 Summary of Local Heritage Resources .....	19
6.2.1 Stone Age.....	20
6.2.2 Rock Art.....	20
6.2.3 Iron Age .....	20

6.2.4	Historical/Colonial period .....	21
6.2.5	Graves/Burials .....	23
6.2.6	Intangible Heritage.....	24
6.2.7	Graded sites on SAHRA database.....	24
6.3	Overall heritage sensitivity .....	27
6.4	Palaeontological sensitivity .....	31
7.	ASSESSMENT OF THE IMPACT OF DEVELOPMENT.....	32
7.1	Possible Impacts .....	32
7.2	Possible Mitigation Measures .....	34
8.	RECOMMENDATIONS.....	36
9.	CONCLUSION .....	39
10.	BIBLIOGRAPHY .....	40
	APPENDIX A .....	42
	APPENDIX B.....	49

## TABLE OF FIGURES

<b>Figure 1</b>	Regional locality of the development footprint, indicated on Google Earth Satellite imagery. ....	12
<b>Figure 2</b>	The development footprint, indicated on Google Earth Satellite imagery.....	13
<b>Figure 3</b>	Regional locality of the development footprint, indicated on Google Earth Satellite imagery. ....	13
<b>Figure 4</b>	Locality of the development footprint, indicated on 1: 50 000 2528CD map.....	14
<b>Figure 5</b>	Locality of the development footprint, indicated on 1: 50 000 2528CD map.....	14
<b>Figure 6</b>	Indication of the vegetation types in and around the study area (namely Rand Highveld Grassland, Andesite Mountain Bushveld, Careltonville Dolomite Grassland, Eastern Highveld Grassland, Gold Reef Mountain Bushveld, and Marikana Thornveld). ....	15
<b>Figure 7</b>	Imperial Map of Pretoria. Image from UCT digital collections, <a href="https://digitalcollections.lib.uct.ac.za/">https://digitalcollections.lib.uct.ac.za/</a> .....	19
<b>Figure 8</b>	<i>The Project area indicated on the Heritage Screening tool (<a href="https://screening.environment.gov.za/">https://screening.environment.gov.za/</a>) .....</i>	28
<b>Figure 9</b>	<i>The Project area indicated on the Heritage Screening tool (<a href="https://screening.environment.gov.za/">https://screening.environment.gov.za/</a>) .....</i>	28
<b>Figure 10</b>	Map composite of Graded heritage resources recorded from the SAHRA database in the area. ....	29
<b>Figure 11</b>	Map composite of Graded heritage resources recorded from the SAHRA database in the area. ....	30
<b>Figure 12</b>	The Heritage Paleo screening tool and SAHRIS PalaeoSensitivity Map, indicating High (red), Medium (yellow), and Low(green) palaeontological significance in the study area, ( <a href="https://screening.environment.gov.za/">https://screening.environment.gov.za/</a> ; <a href="https://sahris.sahra.org.za/map/palaeo">https://sahris.sahra.org.za/map/palaeo</a> ). ....	31

## ABBREVIATIONS

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

## GLOSSARY

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



## 1. INTRODUCTION

### 1.1 Scope of study

The project involves the proposed construction of residential units, schools and business facilities, Grootfontein RE/1/394 JR, Gauteng Province, City of Tshwane, Gauteng Province. UBIQUE Heritage Consultants were appointed by GKM Environmental 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 an archaeological desktop 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 timely and accurate identification and effective management of heritage resources for present and future generations.

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

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



## 1.2 Assumptions and limitations

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

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

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



## 2. TERMS OF REFERENCE

### 2.1 Statutory Requirements

#### 2.1.1 General

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

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

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

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

#### 2.1.2 National Heritage Resources Act 25 of 1999

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

- co-ordinate 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 5000m<sup>2</sup> 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 000m<sup>2</sup> 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 administered by a local authority. Graves in the category located inside a formal cemetery administered by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

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

(3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

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

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

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

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

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

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

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

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



## 3. STUDY APPROACH AND METHODOLOGY

### 3.1 Desktop study

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

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

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

#### 3.1.1 Literature review

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

#### 3.1.2 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.

### 3.2 Determining significance

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

- It is important in the community or pattern of South Africa's history;
- It has uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- It has the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- It is vital in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- It exhibits particular aesthetic characteristics valued by a community or cultural group;
- It is essential in demonstrating a high degree of creative or technical achievement at a particular period;
- It has a strong or unique association with a particular community or cultural group for social, cultural or spiritual reasons;
- 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;
- 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	
<b>LOW</b>	A cultural object found out of context, not part of a site or without any related feature/structure in its surroundings.
<b>MEDIUM</b>	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.
<b>HIGH</b>	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	
<b>National Grade I</b>	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.
<b>Provincial Grade II</b>	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.
<b>Local Grade IIIA</b>	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).
<b>Local Grade IIIB</b>	Heritage resources are of local importance and worthy of conservation. Therefore, it should be included in the heritage register and mitigated (high/ medium significance).
<b>General Protection Grade IVA</b>	The site/resource should be mitigated before destruction (high/ medium significance).
<b>General protection Grade IVB</b>	The site/resource should be recorded before destruction (medium significance).
<b>General protection Grade IVC</b>	Phase 1 is considered as sufficient recording, and it may be demolished (low significance).

### 3.2.1 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.
Duration	LOW	0-4 years (i.e. duration of construction phase).
	MEDIUM	5-10 years.
	HIGH	More than 10 years to permanent.
Intensity	LOW	Where the impact affects the heritage resource in such a way that its significance and value are minimally affected.
	MEDIUM	Where the heritage resource is altered, and its significance and value are measurably reduced.
	HIGH	Where the heritage resource is altered or destroyed to the extent that its significance and value cease to exist.
Potential for impact on irreplaceable resources	LOW	No irreplaceable resources will be impacted.
	MEDIUM	Resources that will be impacted can be replaced, with effort.
	HIGH	There is no potential for replacing a particular vulnerable resource that will be impacted.
Consequence	LOW	A combination of any of the following: <ul style="list-style-type: none"> <li>Intensity, duration, extent and impact on irreplaceable resources are all rated low.</li> <li>Intensity is low and up to two of the other criteria are rated medium.</li> <li>- Intensity is medium, and all three other criteria are rated low.</li> </ul>
	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.

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

### 3.3 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 Association of South African Professional Archaeologists (ASAPA) guidelines. 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 GKM Environmental 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 construction of residential units, schools and business facilities, Grootfontein RE/1/394 JR, Gauteng Province, City of Tshwane, Gauteng Province.

The site is southeast of Pretoria and northwest of Bapsfontein. The existing Grootfontein Country Estate surrounds it to the north, the Rietfontein residential area to the east and the Blue Crane Estate to the south. The proposed development will entail residential units, schools and business facilities.

### 4.1 Technical information

PROJECT DESCRIPTION	
Project name	Phase 1 Heritage Desktop Study Report Grootfontein Re/1/394 Jr, Gauteng Province
Description	Phase 1 HIA Desktop Study Report for the Proposed Construction of Residential Units, Schools and Business Facilities, Grootfontein RE/1/394 JR, Gauteng Province, City of Tshwane, Gauteng Province
DEVELOPER	
Private	
Development type	Residential Units, Schools And Business Facilities
CONSULTANTS	
Environmental	GKM Environmental
Heritage and archaeological	UBIQUE Heritage Consultants
Palaeontological	Marion Bamford
PROPERTY DETAILS	
Province	Gauteng
District municipality	City of Tshwane
Local municipality	N/A
Topo-cadastral map	2528CD
Farm name	Grootfontein RE/1/394 JR
Closest town	Pretoria
GPS Co-ordinates	25° 53'50.77"S 28° 21'59.76"E
PROPERTY SIZE	Approx. 713ha
DEVELOPMENT FOOTPRINT SIZE	N/A
LAND USE	

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

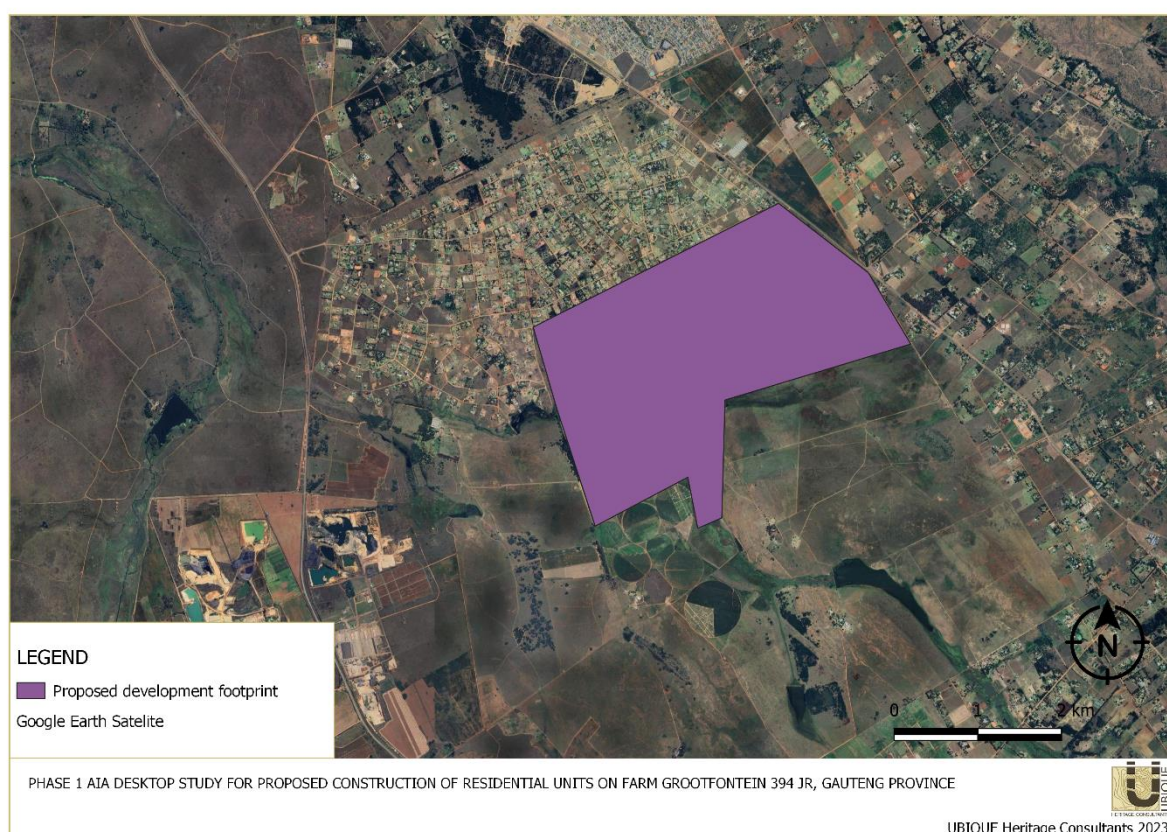


Figure 1 Regional locality of the development footprint, indicated on Google Earth Satellite imagery.





Figure 2 The development footprint, indicated on Google Earth Satellite imagery.

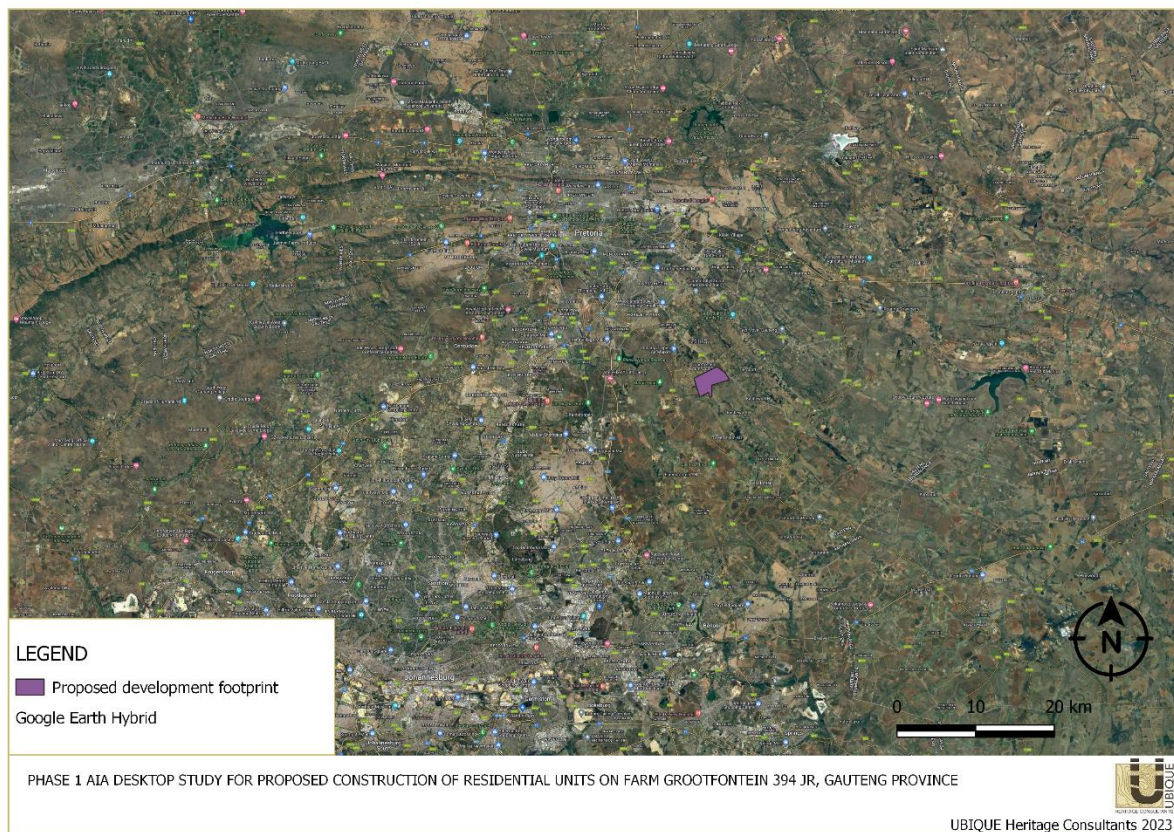


Figure 3 Regional locality of the development footprint, indicated on Google Earth Satellite imagery.



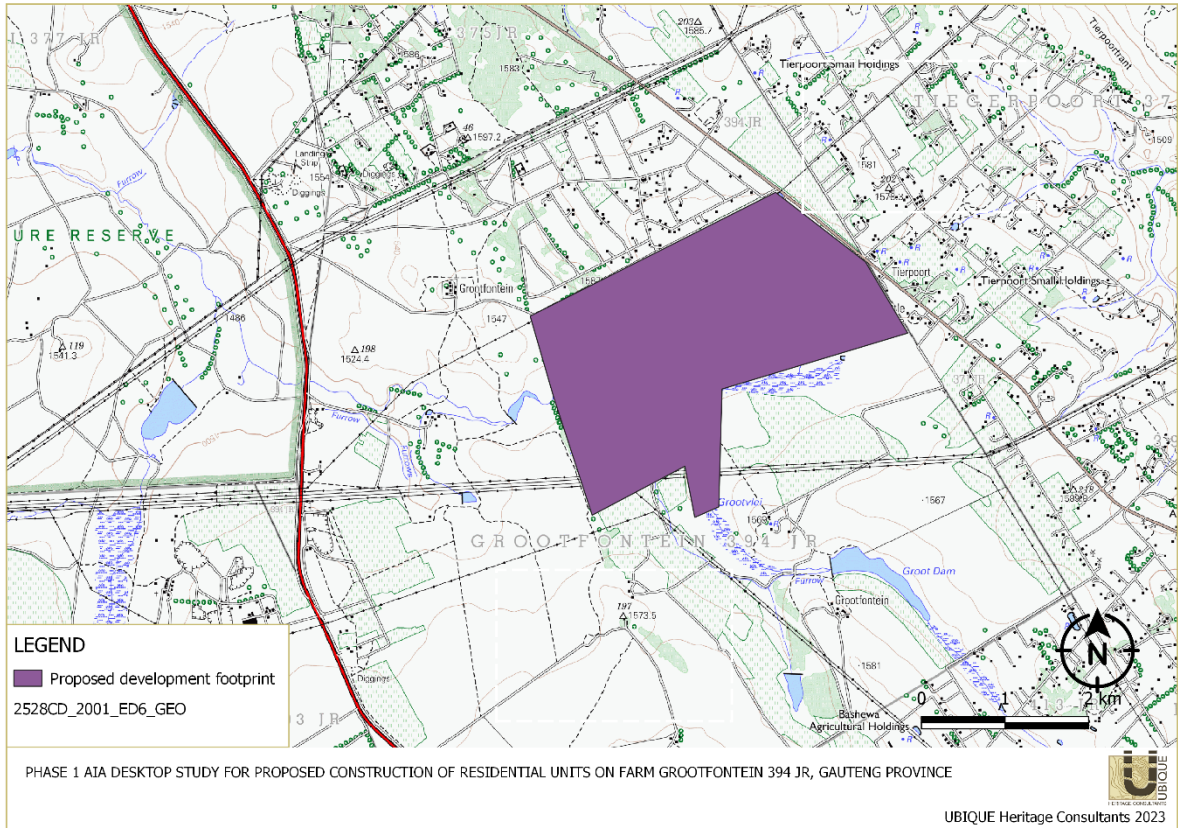


Figure 4 Locality of the development footprint, indicated on 1: 50 000 2528CD map.

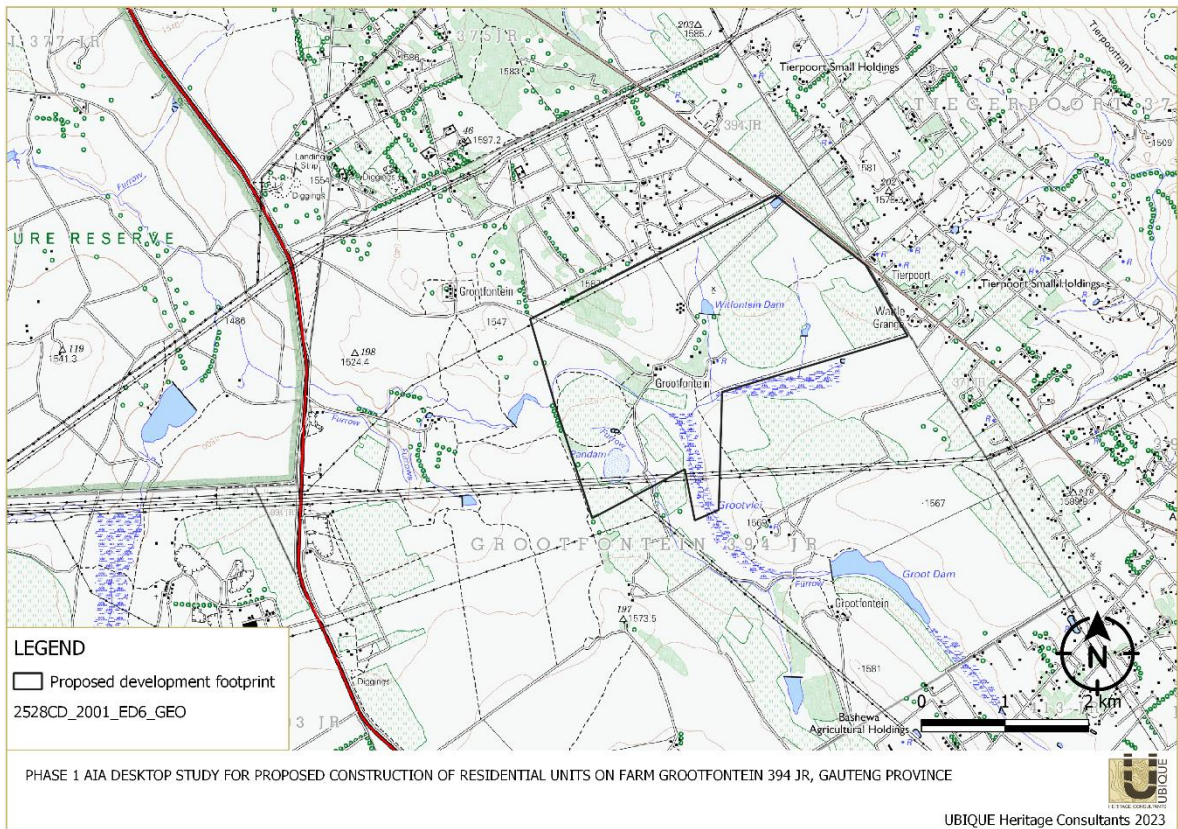
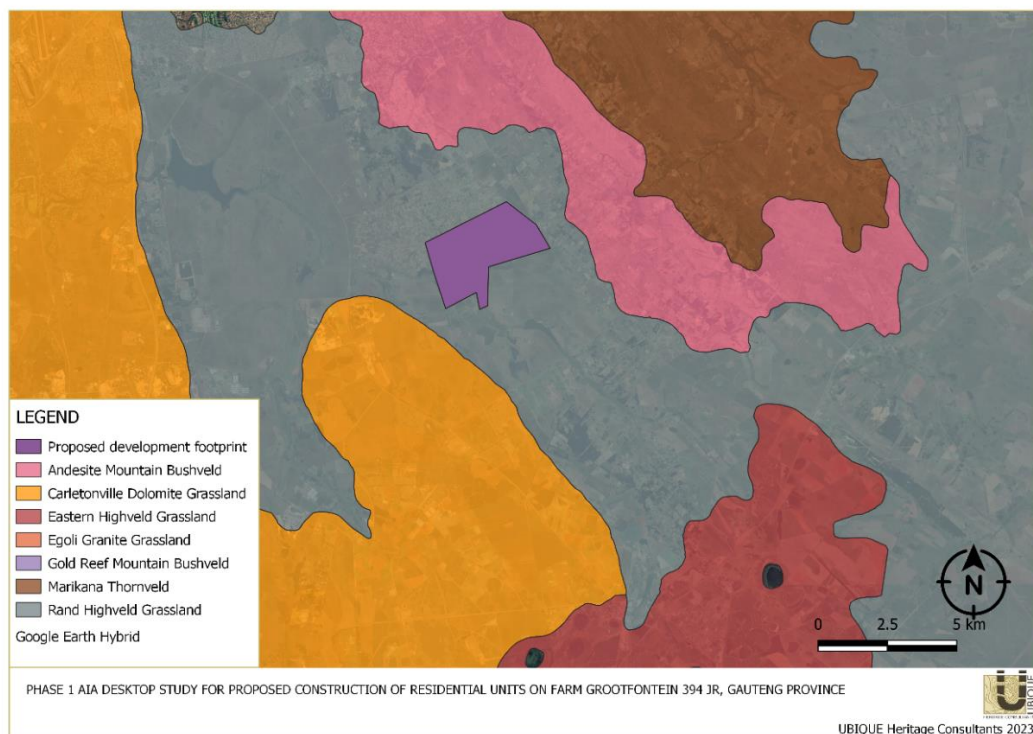


Figure 5 Locality of the development footprint, indicated on 1: 50 000 2528CD map.

## 5. DESCRIPTION OF AFFECTED ENVIRONMENT

The development area falls within the Rand Highveld Grassland vegetation type, surrounded by Andesite Mountain Bushveld, Careltonville Dolomite Grassland, Eastern Highveld Grassland, Gold Reef Mountain Bushveld, and Marikana Thornveld vegetation types. The Rand Highveld Grassland has a diverse landscape of vast sloping plains and a succession of ridges slightly elevated above the undulating plains surrounding them (Mucina & Rutherford 2006). The predominant geological formations in the area are the Quartzite ridges belonging to the Witwatersrand Supergroup, the Pretoria Group, and the Selons River Formation of the Rooiberg Group (the latter two being part of the Transvaal Supergroup). These formations yield a range of soils, including shallow Glenrosa and Mispah forms, mainly found on rocky ridges (Mucina & Rutherford 2006).

The vegetation in the area is characterised by a diverse and abundant array of wiry, sour grassland interspersed with low, sour shrubland found on rocky outcrops and steeper inclines. The plains are predominantly covered with grasses, with the most prevalent ones belonging to the following genera: *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. Additionally, the region boasts a rich variety of herbaceous plants, with a significant portion belonging to the Asteraceae family. The rocky hills and ridges are sparsely covered with (savannoid) woodlands that feature species such as *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Acacia caffra*, and *Celtis africana*. These woodlands are accompanied by a diverse collection of shrubs, among which the genus *Rhus*, particularly *R. magalismonata*, is most common (Mucina & Rutherford 2006).



**Figure 6** Indication of the vegetation types in and around the study area (namely Rand Highveld Grassland, Andesite Mountain Bushveld, Careltonville Dolomite Grassland, Eastern Highveld Grassland, Gold Reef Mountain Bushveld, and Marikana Thornveld).



## 6. HERITAGE SENSITIVITY

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 Gauteng province.

### 6.1 Historical and archaeological background of the general area

Briefly, the region's cultural landscape is characterised by two distinct elements. The first is a pre-colonial aspect, comprising evidence of occupation during the Stone Age and Iron Age periods. The second element is the colonial/historical period (Van Schalkwyk 2015).

Around 300 to 400 years ago, the Pretoria region was first inhabited by the southern Ndebele people (SAHO 2018). By approximately 1600, the Southern Transvaal Ndebele had settled in the river valley, which would later become the site of Pretoria (Gaigher 2017). 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). There was widespread chaos and warfare among the indigenous peoples of southern Africa during this period. In 1825, a group of refugees led by Mzilikazi (one of King Shaka's generals that fled from Shaka's army) arrived in the area. Various Nguni groups migrated across the Drakensberg Mountains, seeking refuge from Zulu expansion in KwaZulu Natal (Gaigher 2017, SAHO 2018). Upon his arrival, Mzilikazi attacked and destroyed the Bakwena group and the Ba-Hurutsi. Mzilikazi's destructive path extended as far as the Orange River, wiping out the region's previous inhabitants. The adult men from these groups were killed, while the young boys and girls were assimilated into the Matabele community. Mzilikazi established his dominion over the surrounding groups, stretching from the Orange River in the south to Mozambique in the northeast, including Bechuanaland. In Pretoria, Mzilikazi constructed two military kraals named "enDinaneni" and "enKungweni." The former was located northwest of Pretoria on the route to Hartebeespoort Dam, while the latter was built along the Daspoort range of hills. Initially, Mzilikazi resided on the southern side of Meintjieskop, but later relocated to the northern part of the Magaliesberg range, where he established a place called "emHlahlandlela" as his main residence (SAHO 2018).

In 1836, alarming reports reached Mzilikazi that a large number of white settlers were moving southward, intending to invade his territory. Feeling threatened, Mzilikazi launched a fierce attack on the Voortrekkers, led by General Hendrik Potgieter. Despite suffering heavy casualties and losses of livestock, the Voortrekkers managed to repel the attackers. Shortly thereafter, Mzilikazi launched a second assault on the Voortrekkers, successfully capturing all the livestock owned by the settlers (SAHO 2018). Undeterred, Potgieter was determined to retaliate. He launched a counter-attack on the Matabele at Mosega and recovered a significant portion of their livestock. In December 1837, Potgieter mounted another offensive against Mzilikazi and his people. This battle,

combined with the earlier conflict waged by Dingane a few months prior, forced Mzilikazi to flee across the Limpopo River. With Mzilikazi's departure, Potgieter easily drove the remaining Matabele stragglers northward over Silkaatsnek (Ghaiger 2017; SAHO 2018).

In the early 19th century, Voortrekkers began arriving in the region, establishing settlements and asserting their authority as part of the South African Republic (ZAR). From the late 1840s onwards, large portions of land began to be occupied by white settlers, who claimed these areas as farms. The first white settlers to establish themselves in Pretoria were the Bronkhorst brothers, Lucas and Gert, who arrived in 1840 and registered the farms "Groenkloof" and "Elandspoort". The first "boer" homestead was established by J.G.S. Bronkhorst in Fountains Valley in 1840 (Gaigher 2017; SAHO 2018; Van Schalkwyk 2017). In 1852, the Sand River Convention was signed, granting independence to the Transvaal Boers, who then established the Zuid Afrikaanse Republiek (ZAR). On November 15, 1853, the first Volksraad (People's Council) was established. Marthinus Wessel Pretorius acquired the farms Elandspoort and Koedoespoort. The two farms were officially declared a town and came to be known as Pretoria (Gaigher 2017; SAHO 2018). The name of the legislative capital of South Africa, Pretoria, is derived from the trek leader Andries Pretorius, who settled in the area around 1848. In 1855, Marthinus Pretorius established Pretoria, naming it after his father, General Andries Pretorius, who had earned acclaim among the Voortrekkers for his triumph over the Zulus in the Battle of Blood River. Marthinus Pretorius was elected as the inaugural President of the ZAR (Zuid Afrikaanse Republiek) in 1857. Although he was compelled to resign in 1860, he was subsequently re-elected to the presidency in 1864 (Gaigher 2017; SAHO 2018). The name of the Municipality, Tshwane, is believed to have originated from a legendary Manala chief (SAHO 2018).

Following the establishment of Pretoria in 1850, various services, including road networks, started to develop. The growing population necessitated an increased food supply, leading to the development of farming activities on the fertile alluvial soils along the banks of the Apies River, taking advantage of the proximity to water sources (Van Schalkwyk 2017). On 1 May 1860, Pretoria was established as the South African Republic's (ZAR) capital, signifying the end of the Boers' movements during the Great Trek (Gaigher 2017). The development of the town commenced in 1856 when Andries du Toit, an advisor to the president, acquired the entire area now recognised as Arcadia by exchanging one of his Basutho ponies (Gaigher 2017).

In 1888, J.D. Cilliers, a dedicated resident and gardener, introduced Jacaranda trees from Rio de Janeiro and planted them in his Myrtle Grove garden. These trees thrived, giving rise to the city's well-deserved moniker as the 'Jacaranda City,' with approximately 50,000 Jacarandas adorning its streets (Gaigher 2017). In April 1877, the British annexed the Transvaal, leading to a continuous influx of immigrants and migrants. Following the Transvaal War of Independence, the British forces retreated, and Paul Kruger assumed control. In 1880, the Boers proclaimed their independence at Paardekraal. After the Battle of Majuba in 1881, the war concluded with the reinstatement of the Transvaal Republic according to the terms of the Pretoria Convention. Paul Kruger was elected as President in 1883 (Gaigher 2017).

In the early years, white farmers would choose their farms and describe the local landdrost, who would record the details in a registration book and provide a copy to the claimant. After an inspection process, the claimed land would be granted a title and deed. However, due to the costs and annual taxes associated with land registration, many landowners would intentionally delay the process as much as possible. As a result, the registration of land based on burgher rights continued until the 1890s. During the 2nd Anglo-Boer War, the area where land was being claimed became the target of British troops' advance. The "Battle of Diamond Hill" or "Slag van Donkerhoek" took place on 11 and 12 June 1900 and was one of the war's most significant battles. Remnants of gun placements, trenches, and fortifications from this battle can still be found today (Van Schalkwyk 2015 and 2023).

Since its establishment in 1855, urban development in Pretoria has primarily focused on the central area surrounding Church Square. Other areas experienced mainly agricultural settlement, with the original farms being subdivided to accommodate growing families (Van Schalkwyk 2015 and 2023). At the heart of Pretoria lies Church Square, initially known as Market Square. This square, which used to be the centre of Pretoria, now houses several historically significant buildings, such as the Ou Raadsaal (Council Chamber) and the Palace of Justice. It was here that the first church in Pretoria was constructed, though it was unfortunately destroyed by fire in 1882. One prominent feature of the square is the striking bronze statue of Paul Kruger situated at its centre (Gaigher 2017). During the 1880s and 1890s, Pretoria experienced expansion with the addition of several new suburbs, including Arcadia in 1889, Sunnyside in 1890, and Pretoria West in 1892. This period also witnessed a surge in the construction of hospitals, schools, churches, and government buildings. The Delagoa railway was inaugurated on January 1, 1895, and electricity was introduced in 1892. In 1899, the Pretoria branch of the Transvaal University College (TUC) was established, serving as a precursor to the University of Pretoria (Gaigher 2017). However, during the Boer War (1899-1902), Pretoria was eventually surrendered to the British despite being defended by four forts, including Fort Wonderboom. The war concluded with the signing of the Treaty of Vereeniging on May 31, 1902, which took place at Melrose House in Pretoria. This treaty brought together the Boer Republics of the ZAR and the Orange Free State with the Cape Colony and Natal Colony, forming the Union of South Africa in 1910. The iconic Union Buildings, housing the administrative offices of the new state, were completed in 1913 (Gaigher 2017).

On October 14, 1931, Pretoria attained official city status. Even after South Africa became a republic in 1961, Pretoria retained its role as the administrative capital. One notable landmark is the Voortrekker Monument, which was unveiled in 1949 and designed by architect Gerard Moerdijk (Gaigher 2017).

Between 1940 and 1950, there was a significant increase in the urban population, leading to the development of numerous new suburbs on the city's outskirts. Alongside the growth of urban areas, there was also the development and settlement of smallholdings near these urban centres. The establishment of agricultural smallholdings in the Transvaal occurred after World War I, but a significant increase in their numbers occurred primarily between 1935 and 1939. Over time, these smallholdings, including Montana, Olympus, and Willow Glen, gradually transformed into fully-fledged residential suburbs. In the 1960s, additional smallholdings emerged in Zwavelpoort and



its neighbouring farms, namely Kleinfontein, Mooiplaats, Boschkop, and Rietfontein. These new developments fell under the jurisdiction of the Transvaal Peri-Urban Areas Health Board (Van Schalkwyk 2015 and 2023).



**Figure 7** Imperial Map of Pretoria. Image from UCT digital collections, <https://digitalcollections.lib.uct.ac.za/>

## 6.2 Summary of Local Heritage Resources

Due to the vast amount of CRM reports on the SAHRA database, this desktop study does not include all the CRM reports done on the broader region and Pretoria. Instead, it focuses on assessments conducted in a 1-20 km periphery. However, most reports recorded artefacts and features relating to the Stone Age, Iron Age and the Historical Period. These reports were obtained from the SAHRA database.

Impact assessment(s) have been done on Grootfontein 394 JR portion 9. However, no important cultural heritage resources or graves were present (Küsel 2007). Moreover, the desktop study revealed that a few Impact Assessments had been done around the proposed development area. Some of the consulted assessments reported on cultural material and features relating to the Iron Age and the Historical/Colonial era (e.g., Celliers 2018; Küsel 2012; Pelsler 2018; Van Schalkwyk 2002a, 2015). At the same time, several of the impact assessments reported no archaeological and heritage resources (e.g. Dreyer 2006; Kaplan 2002; Roodt 2022; Van Schalkwyk 2002b, 2017, 2023).

### 6.2.1 Stone Age

Lithic materials dating to the Stone Age have been identified in the broader region. Stone tools associated with the Early and Middle Stone Age can be found, particularly along the spruits and rivers intersecting with ridges and at the lower sections of these ridges and larger outcrops (Van Schalkwyk 2015 & 2023). One notable Stone Age site in the region is Wonderboom Neck, believed to have existed around 200,000 years ago. Tools attributed to the inhabitants of this site are scattered throughout the area, including the streambed of the Apies River. Also, MSA and LSA communities traversed the region, often seeking shelter along the riverbanks, caves and rock shelters. In the Garstfontein region, several quarry sites associated with the Oakhurst tradition have been identified. Unfortunately, due to the process of urbanization, many of these sites have been destroyed (Van Schalkwyk 2017). The majority of stone age occurrences that have been found have little significance, as they are often out of context and have been disturbed by natural erosion (Van Schalkwyk 2015 & 2023).

Moreover, in the Pretoria region, archaeologists have made significant discoveries of some of the earliest formal stone tools in the world. During the Earlier Stone Age, the quartzite ridge above the zoo served as a quarry for the production of tools like handaxes and cleavers. Similar artefacts were also uncovered during excavations for the Zambezi Drive toll gate at the eastern end of the ridge. These artefacts found in the quarry and activity area may date back as far as a million years (SAHO 2018).

None of the consulted reports documented Stone Age lithic material within the periphery of 15 km.

### 6.2.2 Rock Art

Several rock art sites have been documented on the SAHRA Database in the wider Gauteng region. However, no sites have been recorded directly within or near the proposed development area.

### 6.2.3 Iron Age

The wider region appears to have yielded a number of known sites dating to the Iron Age periods. One notable site is the Broederstroom site, which dates back to the Early Iron Age (EIA). This site is south of Hartebeestpoort Dam in the North West Province. (Van Schalkwyk 2023; (SAHO 2018).

Various sites dating to the Late Iron Age are found all over the region. These sites exhibit cultural associations with various groups, including the Tswana speakers, Ndebele speakers, and potentially a few linked to the Ndebele of Mzilikazi. A concentration of Iron Age sites is noticeable in the Bronberg area and the open flatlands, particularly in locations where rock outcrops such as dolerite are found (Van Schalkwyk 2015 & 2023).

A notable collection of Late Iron Age stone-walled sites exists in the eastern section of the Klipriviersberg, extending towards Alberton. These sites, dating from the 18th and 19th centuries and potentially even as early as the 16th century, are predominantly located along and atop the rocky ridges. Late Iron Age sites within the southeastern border of Ekurhuleni are considered an extension or "spill-over" from a more significant concentration situated further west in the Witwatersrand region. Significant clusters of stone-walled sites can also be found in the mountainous area surrounding the Suikerbosrand in Heidelberg, directly south of Johannesburg (Gaigher 2017).

There was one instance of LIA site identified in the consulted reports:

IRON AGE RESOURCES RECORDED IN A 20 KM RADIUS			
HIA/AIA	SITE	CO-ORDINATES	HERITAGE RESOURCES
		PROXIMITY TO STUDY AREA	
Van Schalkwyk 2015	Rietfontein 375JR	S 25.86139, E 28.33750 4.68 km N	Stonewalling dating to the Late Iron Age (i.e. > AD 1600). Unfortunately, this site has been 'reconstructed' by the land-owner, thereby compromising its integrity.

### 6.2.4 Historical/Colonial period

Countless historical period structures and features can be found in the region near Pretoria. Due to the vast amount of these, the following table only refers to historical period resources found within a 0-20 km periphery of the proposed development footprint. Several impact assessments were reported on cultural material and sites associated with the Historical/Colonial Period.

HISTORICAL PERIOD RESOURCES RECORDED IN 20 KM RADIUS			
HIA/AIA	SITE	CO-ORDINATES	HERITAGE RESOURCES
		PROXIMITY TO STUDY AREA	
Celliers 2018	Site TRP 1	S25° 52'42.61" E028° 24'18.00" 4.25 km ENE	A small packed-stone feature. Too weathered to positively identify its purpose.
Celliers 2018	Site TRP 1B	S25° 52'40.90" E028° 24'14.37" 4.19 km ENE	Linear ill-defined stone-packed terracing roughly parallel to the streambed. It was



**HISTORICAL PERIOD RESOURCES RECORDED IN 20 KM RADIUS**

HIA/AIA	SITE	CO-ORDINATES	HERITAGE RESOURCES
		PROXIMITY TO STUDY AREA	
			possibly constructed to counter soil erosion as part of agricultural activities in the past.
Celliers 2018	Site TRP 1C	S25° 52'42.70" E028° 24'15.07" 4.10km ENE	Linear ill-defined stone-packed terracing roughly parallel to the streambed. It was possibly constructed to counter soil erosion as part of agricultural activities in the past.
Celliers 2018	Site TRP 2	S25° 52'39.62" E028° 24'14.07" 4.18 km ENE	Linear ill-defined stone-packed terracing roughly parallel to the streambed. It was possibly constructed to counter soil erosion as part of agricultural activities in the past.
Celliers 2018	Site TRP 3	S25° 52'39.07" E028° 24'12.59" 4.13 km ENE	The ruined remains of a possible building foundation and collapsed walling of some locally manufactured clay bricks. Much weathered and possibly served as farm workers' quarters at some stage. Care should be taken here regarding construction activities as there is a possibility that unmarked graves may be located close to such a structure.
Celliers 2018	Site TRP 4	S25° 52'43.11" E028° 24'15.12" 4.11 km ENE	This is a single square-packed stone feature. Too weathered to positively identify its purpose.
Celliers 2018	Site TRP 5	S25° 52'42.92" E028° 24'14.69" 4.11 km ENE	This is a single square-packed stone feature. It is too weathered to positively identify its purpose, no diagnostic material remains in order to establish its function.
Celliers 2018	Site TRP 6	S25° 52'41.15" E028° 24'12.86" 4.10 km ENE	This is a small stone-built circular structure which probably served as a dwelling. It reminds of a rondavel. The structure is indicated on topographical maps of 1964 and 1975 but omitted from maps dated 1991 and 2001. It is possible that it was not mapped due to its ruined condition. Care should be taken here regarding construction activities as there is a possibility that unmarked graves may be located close to such a structure.
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 55'47.7"; E 28° 12'53.2" 15.86 km W	Remains of the lime kiln and other works established by John Richard Holmes in the 1890s. This site is linked to the cemetery at the below site number.
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 55'47.7"; E 28° 12'53.2" 15.51 km W	An informal cemetery which is very much overgrown with trees and grass. There might be as many as fifty graves. Although the graves are marked, they do not have inscribed headstones. From the associated grave goods, it is deduced that these graves belong to black people. In all probability, they were labourers at the old lime works.
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 56'19.8"; E 28° 12'12.1" 17.17 km WSW	Original old Olifantsfontein farmstead
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 55'44.6"; E 28° 13'24.1". 14.96 km W	'Sunlawns' farmstead



**HISTORICAL PERIOD RESOURCES RECORDED IN 20 KM RADIUS**

HIA/AIA	SITE	CO-ORDINATES	HERITAGE RESOURCES
		PROXIMITY TO STUDY AREA	
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 55' 33.2"; E 28° 12' 53.7" 15.7 km W	Old cement dam
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 55' 35.5"; E 28° 13' 01.6" 15.49 km W	Old farmstead
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 55' 07.9"; E 28° 11' 51.4" 17.31 km W	Old farmstead
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 56' 19.5"; E 28° 11' 33.9" 18.18km WSW	Old farmstead
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 56' 15.8"; E 28° 11' 11.0" 18.8 km WSW	Old farmstead

**6.2.5 Graves/Burials**

Some consulted impact assessments reported on graves and burials near the proposed development. Moreover, numerous graves have been identified on the SAHRA database.

**GRAVES RECORDED IN A 20 KM RADIUS**

HIA/AIA	SITE	CO-ORDINATES	HERITAGE RESOURCES
		PROXIMITY TO STUDY AREA	
Van Schalkwyk 2015	Rietfontein 375JR	S 25.86528; E 28.33889 4.63 km N	Large informal burial place with possibly more than 20 graves. It is fenced in, and the gate is wired shut. Some have headstones and names, such as Mguni and Tsoba, to the middle part of the 20th century. Unfortunately, the area is much overgrown with grass, and little detail could be observed.
Van Schalkwyk 2002a	Olifantsfontein 402JR	S 25° 56' 19.8"; E 28° 12' 12.1" 17.15 km W	Cemetery of the Strydom family
Van Schalkwyk 2002a	Immediately below the dam wall on Olifantsfontein 402JR	S 25° 56' 20.9"; E 28° 12' 11.3" 17.2 km W	Cemetery of the Strydom family.
Van Schalkwyk 2002a	Next to the dirt road, below the Eskom powerlines on Olifantsfontein 402JR	S25° 56' 46.7"; E 28° 12' 08.4" 17.49 km WSW	A cemetery containing approximately 10 graves, some with headstones.
Pelser 2018	Olifantsfontein 402JR, portion 14	S25 55 41.67 E28 14 05.89 13.81 km W	Grave site with 104 graves.
Küsel 2012	Olifantsfontein 410 JR	S25° 55' 47.0" & E28° 12' 54.5" 15.81 km W	Cemetery has some 130 or more graves
Küsel 2012	Olifantsfontein 410 JR	S25° 55' 50.2" E28° 12' 55.5" 15.8 km W	Cemetery has some 140 graves

## 6.2.6 Intangible Heritage

None of the consulted reports recorded any intangible heritage.

## 6.2.7 Graded sites on SAHRA database

The Gauteng province, specifically within the Pretoria region, has several Graded Sites, such as buildings, monuments, memorials and battlefields, some of which are listed in the table below. Figures 10 and 11 provide an example of Archaeological and heritage sites and their proximity to the proposed development footprint that can be found on the SAHRA database. A complete list can be found on the SAHRA Database:

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

Site/Object Name	Co-ordinates	Grade	Site type	Site Reference	NID
1 to 13 Artillery Road, Pretoria	-25.755950, 28.179422	Grade II	Building	9/2/258/	19237
Old Arts Building, University of Pretoria, Pretoria	-25.755820, 28.230870	Grade II	Building	9/2/258/0001	19238
Dutch Reformed Church, Kirkness Street, Pretoria East, Pretoria	-25.753290, 28.221750	Grade II	Building	9/2/258/0002	19239
Hervormde Church, Du Toit Street, Pretoria	-25.912878, 28.308575	Grade II	Building	9/2/258/0003	19240
Northern Transvaal Command Headquarters, Voortrekkerhoogte, Pretoria	-25.793330, 28.151390	Grade II	Building	9/2/258/0004	19241
Nederlandsche Bank Building, Church Square, Pretoria	-25.745897, 28.187949	Grade II	Building	9/2/258/0006	19242
Staats Model School, Van der Walt Street, Pretoria	-25.751992, 28.193453	Grade II	Building	9/2/258/0008	19243
Melrose House, 275 Jacob Mare Street, Sunnyside, Pretoria	-25.755474, 28.192333	Grade II	Building	9/2/258/0009	19244
Kruger House, Church Street West, Pretoria	-25.746643, 28.181391	Grade II	Building	9/2/258/0010	19245
Cafe Riche, Church Square, Pretoria	-25.746477, 28.188067	Grade II	Building	9/2/258/0012	19247
Law Chambers, Church Square, Pretoria	-26.107096, 28.001972	Grade II	Building	9/2/258/0013	19248
115 Charles Street, Brooklyn, Pretoria	-25.767014, 28.234293	Grade II	Building	9/2/258/0014	19249
3-5 Jacobus Naude Road, Voortrekkerhoogte, Pretoria	-25.793064, 28.141359	Grade II	Building	9/2/258/0016	19251
Old Merensky Library, University of Pretoria, Lynnwood Road, Pretoria	-25.768192, 28.284958	Grade II	Building	9/2/258/0017	19252
Portion 22 of Brakfontein 399 JR, Rooihuiskraal Battlefield, Verwoerdburg, Pretoria	-25.895967, 28.156153	Grade II	Battlefield	9/2/258/0018	19253
Sammy Marks and Kynoch Building, Church Street, Pretoria	-25.745769, 28.194528	Grade II	Building	9/2/258/0019	19254
Old Synagogue, Paul Kruger Street, Pretoria	-25.742577, 28.187994	Grade II	Building	9/2/258/0020	19255

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

Site/Object Name	Co-ordinates	Grade	Site type	Site Reference	NID
Grootkerk, Bosman Street, Pretoria	-25.751380, 28.185851		Building	9/2/258/0021	19256
Tramshed, Van der Walt Street, Pretoria	-25.748724, 28.193815	Grade II	Building	9/2/258/0022	19257
Old Raadsaal, Church Square, Pretoria	-25.731340, 28.218370	Ungraded	Building	9/2/258/0023	19258
Mariammen Temple, Asiatic Bazaar, Pretoria	-25.751648, 28.195013	Grade II	Building	9/2/258/0026	19260
Pioneer House, Silverton, Pretoria	-25.739423, 28.175898	Grade II	Building	9/2/258/0027	19261
Moerdyk House, 274 Pomona Street, Muckleneuk, Pretoria	-25.763145, 28.203903	Grade II	Building	9/2/258/0031	19263
Fort Klapperkop, Groenkloof, Pretoria	-25.780169, 28.209822	Grade II	Battlefield, Building	9/2/258/0032	19264
Barton Keep, Jacob Mare Street, Pretoria	-25.754893, 28.189268	Grade II	Building	9/2/258/0033	19265
Brook House, 109 Brook Street, Brooklyn, Pretoria	-25.761538, 28.246279	Ungraded	Building	9/2/258/0034	19266
Leenhoff House, 799 Schoeman Street, Arcadia, Pretoria.	-25.746016, 28.220769	Ungraded	Building	9/2/258/0036	19268
Volksstem Building, cnr Pretorius Street and Volkstem Lane, Pretoria	-25.748524, 28.186582	Grade II	Building	9/2/258/0037	19269
SA Air Force Officers' Club, Voortrekkerhoogte, Pretoria	-25.792873, 28.152182	Grade II	Building	9/2/258/0038	19270
14 and 15 Artillery Road, Pretoria	-25.756204, 28.178062	Grade II	Building	9/2/258/0040	19271
Mea Vota, 62 Rissik Street, Sunnyside, Pretoria	-25.754852, 28.198774	Grade II	Building	9/2/258/0042	19272
Anton Van Wouw House, Brooklyn, Pretoria	-25.764676, 28.237357	Grade II	Building	9/2/258/0043	19273
Old Agriculture Publication Building, Vermeulen Street, Pretoria	-25.744816, 28.192572	Grade II	Building	9/2/258/0047	19274
Pioneers House, Boekenhoutkloof, District Pretoria	-25.699099, 28.066421	Ungraded	Building	9/2/258/0050	19275
3 Hazelwood Road, Hazelwood, Pretoria	-25.774999, 28.254804	Ungraded	Building	9/2/258/0051	19276
Zwartkoppies Hall, Zwartkopjes, Pretoria	-25.731326, 28.218944	Grade II	Building	9/2/258/0055	19277
National Cultural History Museum, Boom Street, Pretoria	-25.738767, 28.189897	Grade II	Building	9/2/258/0061	19278
Old NZASM Goods Office, Railway Street, Pretoria	-25.758010, 28.190714	Grade II	Building	9/2/258/0062	19279
Smuts House, Doornkloof, Irene, Pretoria	-25.881256, 28.225746	Grade II	Building	9/2/258/0064	19280
Pretoria High School for Girls, Park Street, Pretoria	-25.748982, 28.230062	Grade II	Building	9/2/258/0065	19281
Weskoppies Hospital, Ketjen Street, Pretoria	-25.747044, 28.164928	Grade II	Building	9/2/258/0069	19284
1225 Felix Street, Mountain View, Pretoria	-25.700573, 28.166413	Grade II	Building	9/2/258/0072	19286
Tudor Chambers, Church Square, Pretoria	-25.746390, 28.188110	Ungraded	Building	9/2/258/0074	19287
17 Ben Viljoen Road, Voortrekkerhoogte, Pretoria	-25.790777, 28.150588	Grade II	Building	9/2/258/0075	19288

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

Site/Object Name	Co-ordinates	Grade	Site type	Site Reference	NID
Kirkness House, 290 Celliers Street, Pretoria	-25.763819, 28.203222	Grade II	Building	9/2/258/0078	19290
Green Magazine, Pretoria	-25.734871, 28.311452	Grade II	Building	9/2/258/0079	19291
Pretoria Railway Station, Scheiding Street, Pretoria	-25.757912, 28.188989	Ungraded	Building	9/2/258/0082	19292
Nedbank Building, Church Street, Pretoria	-25.745767, 28.190808	Ungraded	Building	9/2/258/0083	19293
Fort Schanskop, Groenkloof, Pretoria	-25.777141, 28.184577	Grade II	Building	9/2/258/0084	19294
The Fortress and Blockhouse, 2 Johannes Kok Road, Voortrekkerhoogte, Pretoria	-25.791905, 28.154163	Grade II	Building	9/2/258/0087	19296
Defence Headquarters, Potgieter Street, Pretoria	-25.752839, 28.183448	Grade II	Building	9/2/258/0093	19298
State Artillery Stables, Defence Headquarters, Potgieter Street, Pretoria	-25.752813, 28.183430	Grade II	Building	9/2/258/0093/001	19299
Old Machine Building, Defence Headquarters, Potgieter Street, Pretoria	-25.752779, 28.183489	Grade II	Building	9/2/258/0093/002	19300
The Voortrekker Monument, Groenkloof 358-Jr, Pretoria	-25.776330, 28.175801	Ungraded	Monuments & Memorials	9/2/258/0097	19301
The Voortrekker Monument, Groenkloof 358-Jr, Pretoria	-25.776330, 28.175801	Grade I	Monuments & Memorials	9/2/258/0097	19301
Transvaal Museum, Paul Kruger Street, Pretoria	-25.735904, 28.187410	Grade II	Building	9/2/258/0100	19302
Libertas, George Washington Boulevard, Bryntirion, Pretoria	-25.739168, 28.227464	Grade II	Building	9/2/258/0101	19303
138 Gerhard Moerdyk Street, Sunnyside, Pretoria	-25.754120, 28.198281	Ungraded	Building	9/2/258/0102-001	19304
Stone Cottage, Troye Street, Muckleneuck, Pretoria	-25.746111, 28.188056	Ungraded	Building	9/2/258/0104	19306
Oost-Eind Primary School, 70 Meintjies Street, Sunnyside, Pretoria	-25.755753, 28.198493	Grade II	Building	9/2/258/0105	19307
Burg House, Hillcrest, Pretoria	-25.756475, 28.241468		Building	9/2/258/0110	19308
The Kraal, Brummeria, Pretoria	-25.742078, 28.284725	Grade II	Building	9/2/258/0111	19309
Reformed Church, Church Street West, Pretoria	-25.747203, 28.181418	Grade II	Building	9/2/258/0115	19310
Magsa Flats, 734 Arcadia Road, Arcadia, Pretoria	-25.748620, 28.216811		Building	9/2/258/0120	19311
Springbok Park, Schoeman Street, Hatfield, Pretoria	-25.745301, 28.235796	Grade II	Building	9/2/258/0126	19312
Boiler and Blower House, Old Pretoria Iron Mines, Iscor, Pretoria	-25.737678, 28.149304	Grade II	Building	9/2/258/0133	19313
Pretoria High School for Boys, Pretoria	-25.762530, 28.228721	Grade II	Building	9/2/258/0135	19314
Arkleton, 852 Schoeman Street, Arcadia, Pretoria	-25.746598, 28.222732		Building	9/2/258/0138	19315
SA Army College, Voortrekkerhoogte, Pretoria	-25.790045, 28.144137	Grade II	Building	9/2/258/0154	19316

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

Site/Object Name	Co-ordinates	Grade	Site type	Site Reference	NID
Old Native Reception Depot, Proes Street, Pretoria	-25.743587, 28.187983	Grade II	Building	9/2/258/0156	19317
Wierda Bridge, Six Mile Spruit, Centurion, Pretoria	-25.700977, 28.187657	Grade II	Building	9/2/258/0162	19318
Steynberg Estate, Pretoria-North, Wonderboom District	-25.666448, 28.192566	Grade II	Building	9/2/287/0004	19369
Doors Erasmus Complex, Pretoria North, Pretoria	-25.691504, 28.212124	Ungraded	Building	9/2/287/0009	19373
Freedom Park, Salvokop, Pretoria	-25.766537, 28.189636	Grade I	Place, Monuments & Memorials	9/2/258/0186	357236
Pretoria Station Telegraph office	-25.760812, 28.191784	Grade II	Building	NZASM_EL_145	385697
Pretoria Station NZASM Goods Store	-25.760363, 28.192350	Grade II	Building	NZASM_EL_146	385698
Pretoria Station NZASM Shed Gautrain Station	-25.758607, 28.190189	Grade II	Building	NZASM_EL_147	385699
Pretoria Station Printed Matter Store	-25.757563, 28.190119	Grade II	Building	NZASM_EL_148	385700
Pretoria Station Station Master's House	-25.757184, 28.189816	Grade II	Building	NZASM_EL_149	385701

### 6.3 Overall heritage sensitivity

Based on the recorded heritage identified on the SAHRA database and the consulted Impact Assessment, an overall **Cultural Heritage Significance of Low** is given.

The DFFE Screening Tool findings (Figures 8 and 9) indicate that the proposed development footprint where Grootfontein RE/1/394 JR is located has a **Low Heritage Significance** (<https://screening.environment.gov.za/>) with **locations of Medium to Very High sensitivity** towards the southeast, south, southwest, north and northwest, northeast of the proposed project area.



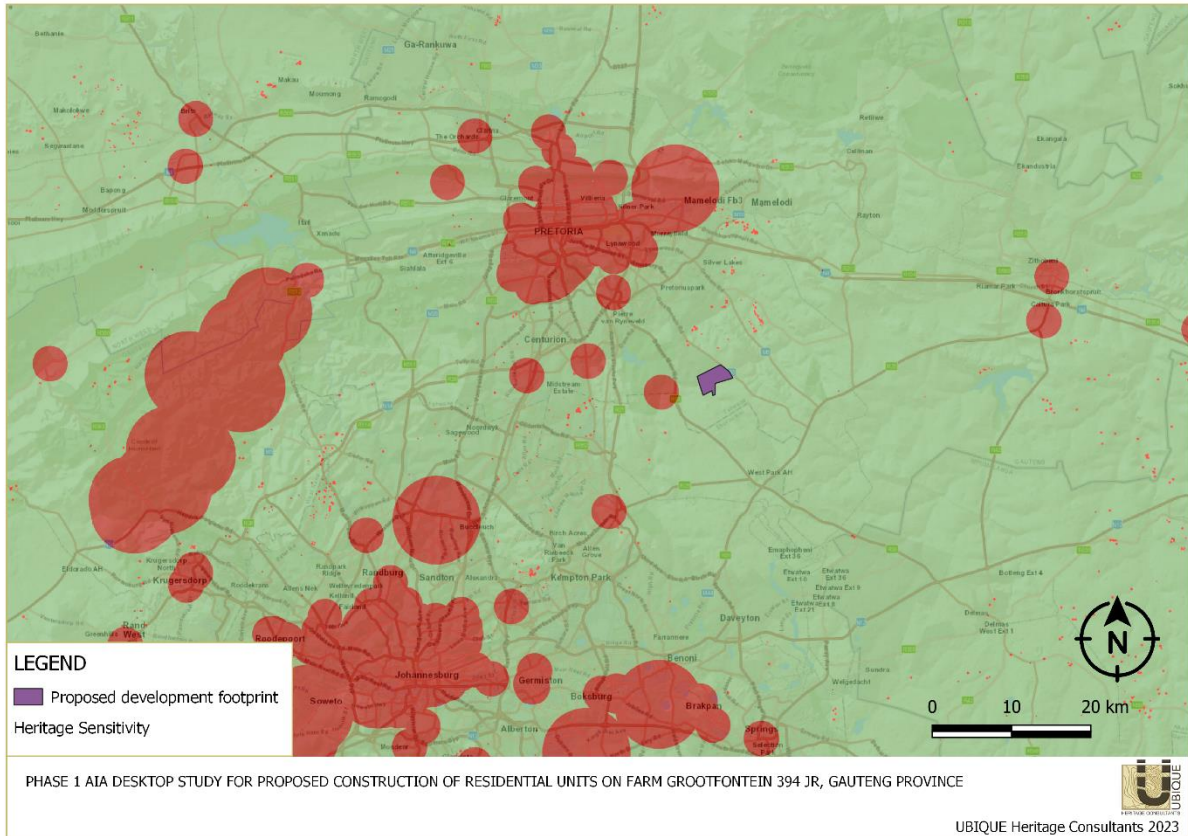


Figure 8 The Project area indicated on the Heritage Screening tool (<https://screening.environment.gov.za/>)

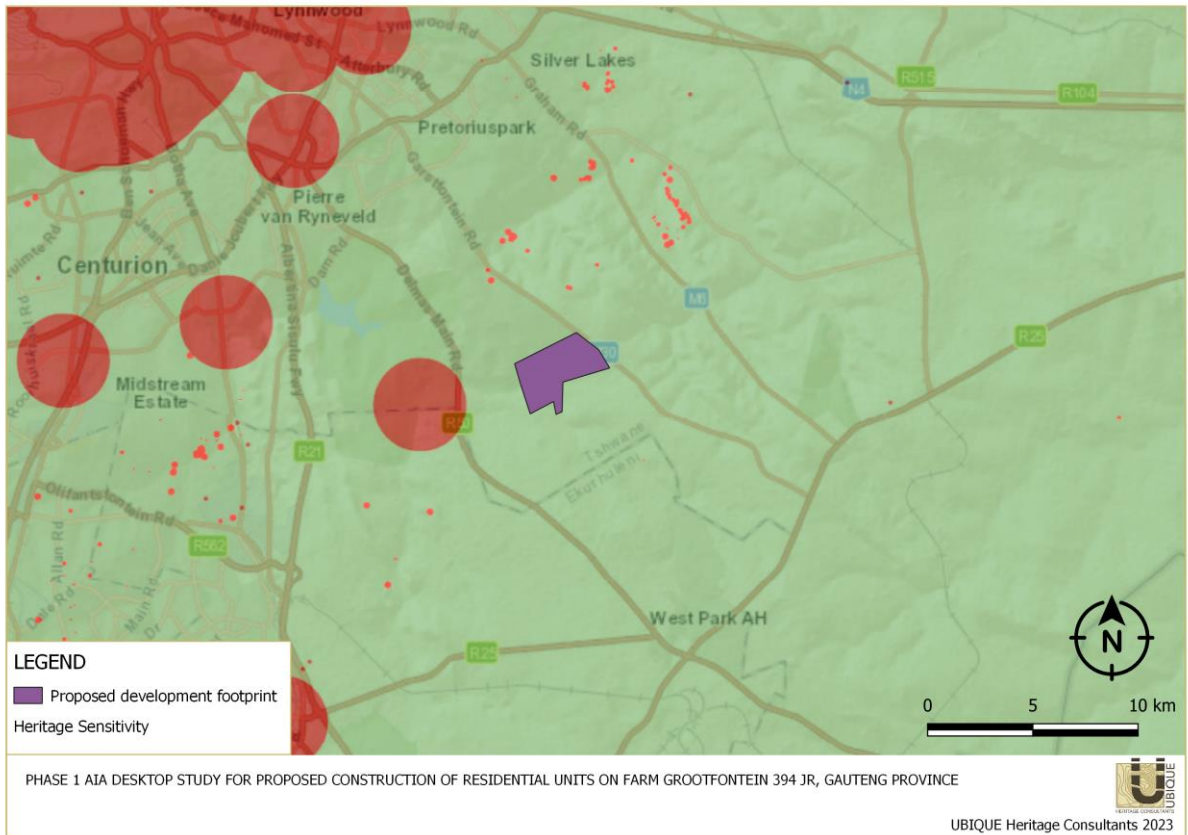


Figure 9 The Project area indicated on the Heritage Screening tool (<https://screening.environment.gov.za/>)



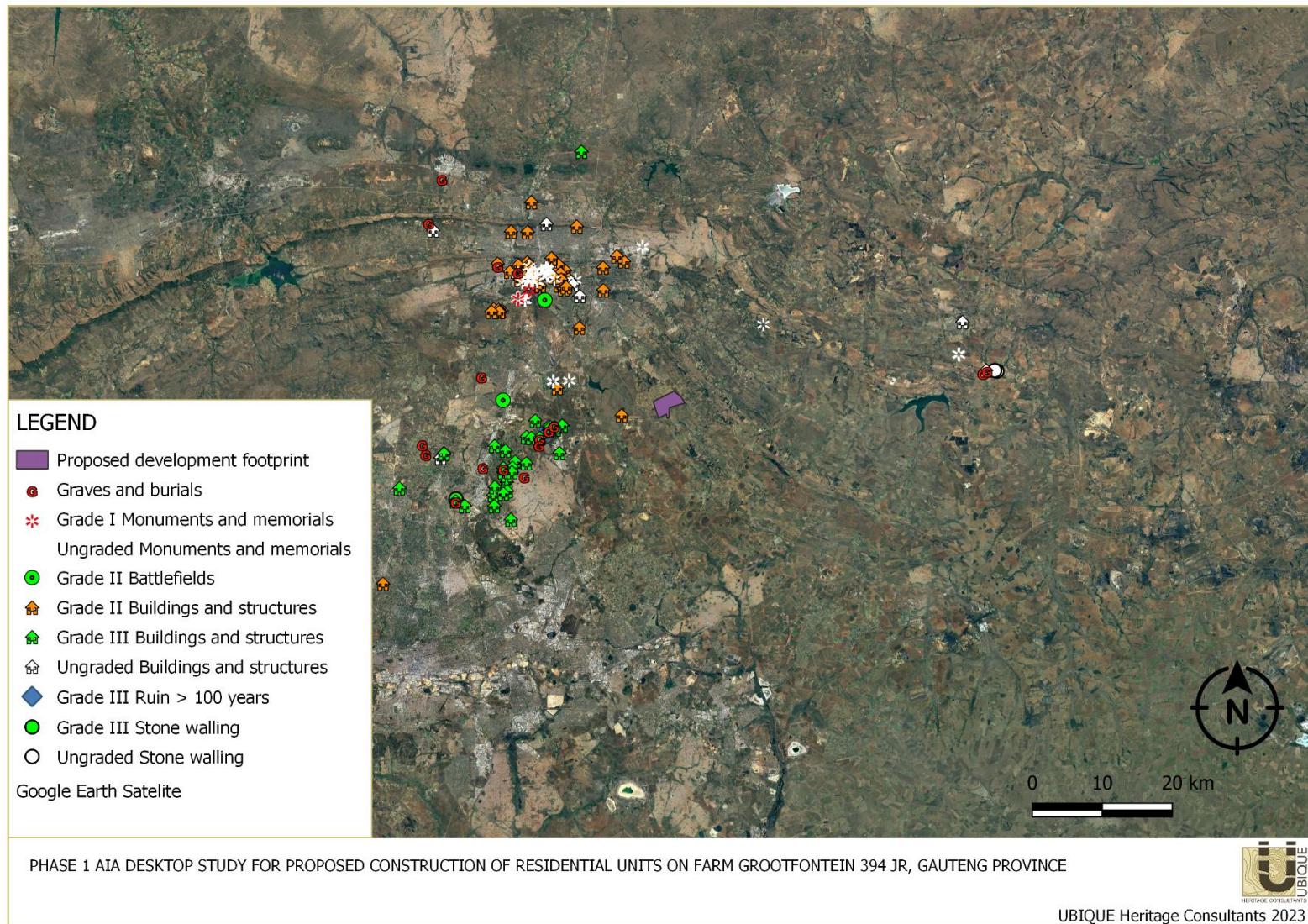


Figure 10 Map composite of Graded heritage resources recorded from the SAHRA database in the area.



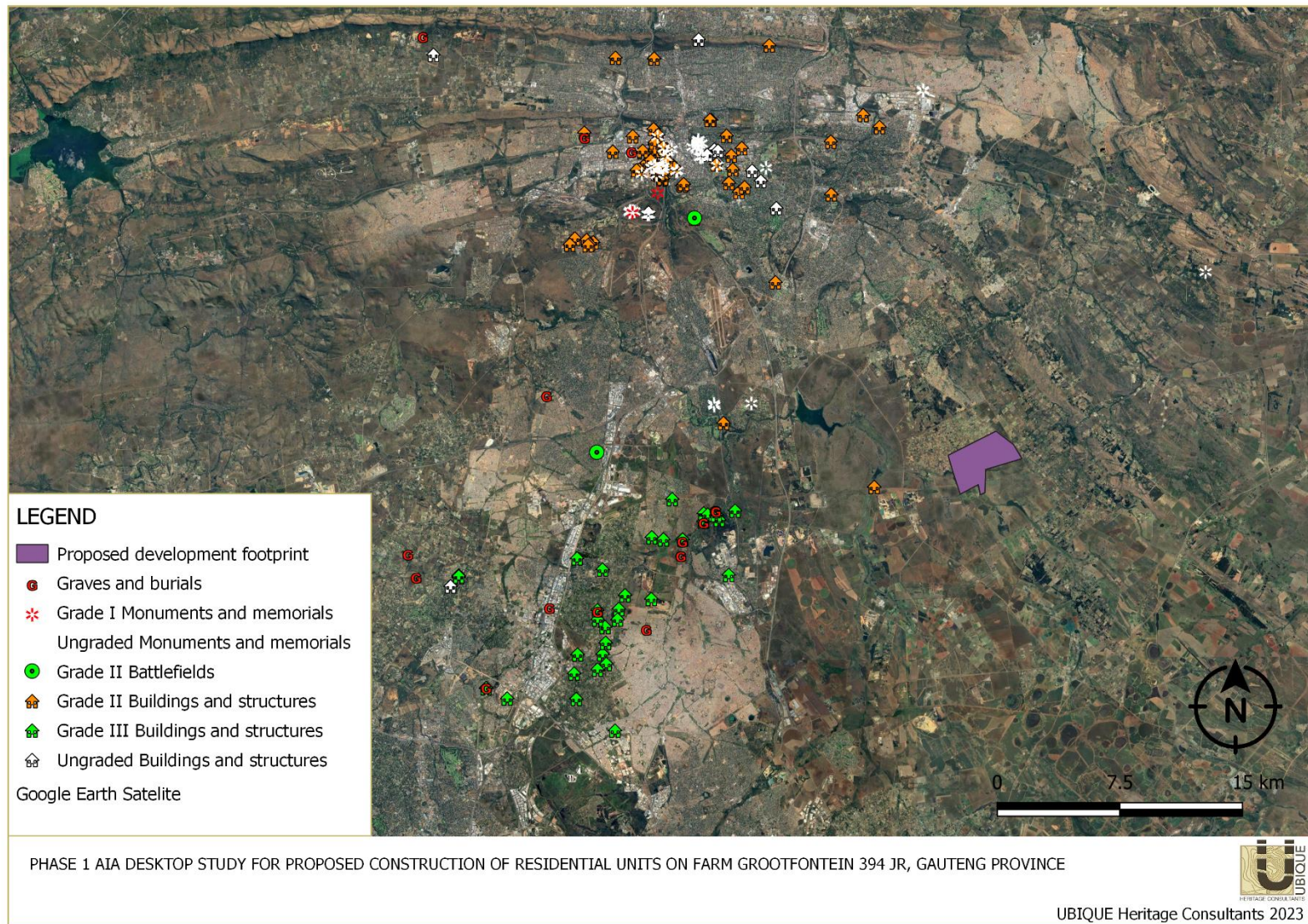
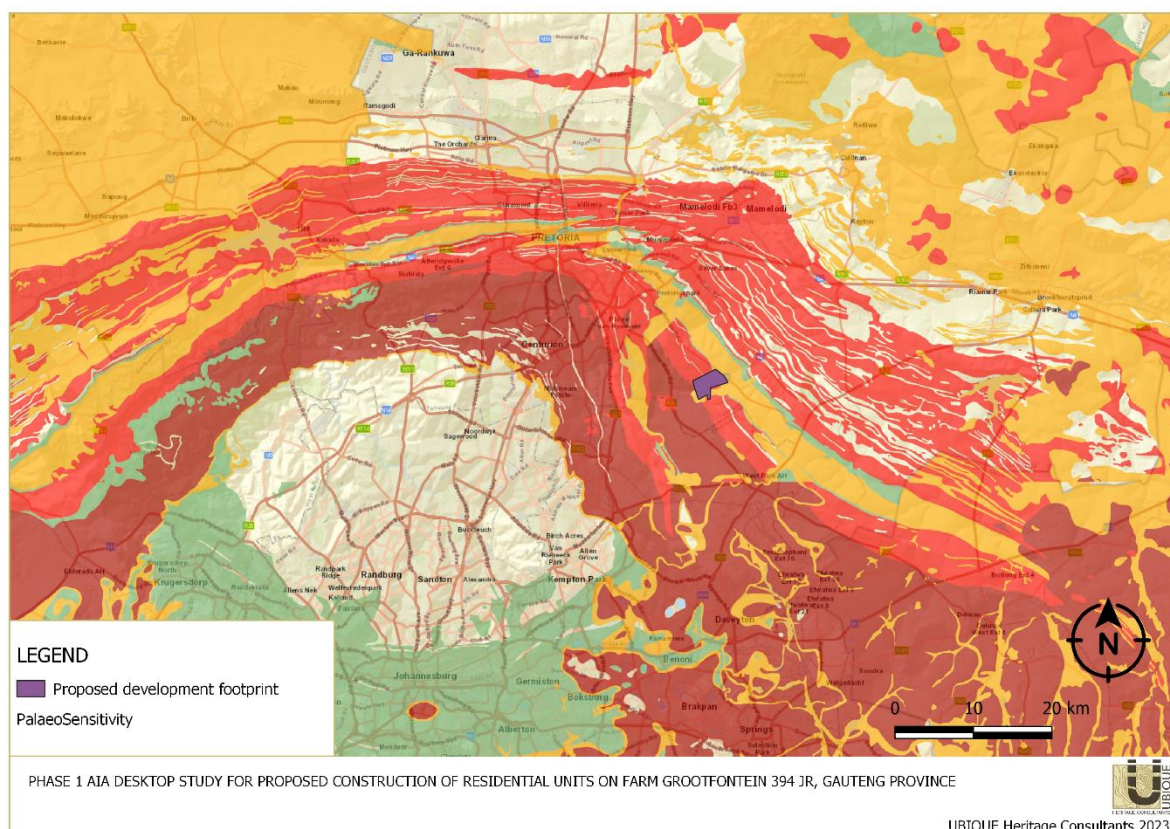


Figure 11 Map composite of Graded heritage resources recorded from the SAHRA database in the area.



## 6.4 Palaeontological sensitivity



**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>).

Overall site sensitivity rating with regard to Palaeontological resources is considered to be: **High to Moderate**.

The proposed site lies on the potentially fossiliferous Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) that might preserve trace fossils such as stromatolites or microbialites. The potential impact on fossil heritage resources is considered to be **extremely low** (Bamford 2023).

Marion Bamford conducted a Palaeontological Impact Assessment report for the development footprint (see Appendix B).



## 7. ASSESSMENT OF THE IMPACT OF DEVELOPMENT

### 7.1 Possible Impacts

Limitations of this Desktop Scoping report are determined by the amount of information available on the South African Heritage Resources Information System (SAHRIS) and the clarity of satellite imaging. Sub-surface archaeological material, sites, graves and informal cemeteries could be directly impacted during the proposed development. Based on available data, this Desktop Report estimates the probability of heritage sites/artefacts located on/near the development footprint.

This report presents deductions and interpretations from the historical background. The following includes potential identified impacts that may take place during the proposed development:

- Although the wider area is known to have a medium to high heritage significance, the proposed development footprint has a low heritage significance, based on the size of the proposed development footprints as well as human activity and the fact that very little cultural material has been recorded in the immediate vicinity, **it is anticipated that little to no archaeological resources of significance would be present on the area. It is thus considered that the proposed development would not have a negative impact on out-of-context cultural material.**
- Since many burials are not always marked on the surface, it is difficult to detect human remains on the landscape. The South African Heritage Resource Agency (SAHRA) has received numerous complaints about the destruction and desecration of graves from rural communities, conservation bodies, interest groups and families of the deceased throughout the country. Many graves have been desecrated during development. It is, thus, vital that all precautions are taken regarding graves/graveyards/burials. The probability of such sites being present is considered to be low; however, it should not be disregarded. The presence of any graves and grave sites must be confirmed during a field survey.

The tables below provide the probability of impact on possible resources.

Nature of Impact	Significance Before Mitigation		Significance After Mitigation		Significance Before Mitigation		Significance After Mitigation	
	Extent	Severity	Extent	Severity	Extent	Severity	Extent	Severity
Stone Age resources: <b>Neutral</b>	Construction Phase				Operational Phase			
	Extent	Low	Extent	Low	Extent	Low	Extent	Low
	Duration	Low	Duration	Low	Duration	Low	Duration	Low
	Severity	Low	Severity	Low	Severity	Low	Severity	Low
	Probability	Low	Probability	Low	Probability	Low	Probability	Low

	Significance	Low	Significance	Low	Significance	Low	Significance	Low
	can be reversed?							No
	may cause irreplaceable loss of resources?							No
	can be avoided, managed, or mitigated?							Yes
	the degree to which the impact and risk can be reversed?							Neutral
	the degree to which the impact and risk may cause irreplaceable loss of resources?							Neutral
	the degree to which the impact and risk can be avoided, managed, or mitigated?							Neutral
	Cumulative Impact							Low (Neutral)

It is anticipated that any out-of-context Stone Age resources identified, if any, would be NCW. Thus, it is considered that there would be no negative impact on these resources.

Nature of Impact	Significance Before Mitigation		Significance After Mitigation		Significance Before Mitigation		Significance After Mitigation	
	Iron Age period resources: <b>Neutral</b>	Construction Phase				Operational Phase		
Extent		Low	Extent	Low	Extent	Low	Extent	Low
Duration		Low	Duration	Low	Duration	Low	Duration	Low
Severity		Low	Severity	Low	Severity	Low	Severity	Low
Probability		Low	Probability	Low	Probability	Low	Probability	Low
Significance		Low	Significance	Low	Significance	Low	Significance	Low
	can be reversed?							No
	may cause irreplaceable loss of resources?							No
	can be avoided, managed, or mitigated?							Yes
	the degree to which the impact and risk can be reversed?							Neutral
	the degree to which the impact and risk may cause irreplaceable loss of resources?							Neutral
	the degree to which the impact and risk can be avoided, managed, or mitigated?							Neutral
	Cumulative Impact							Low (Neutral)

It is anticipated that any out-of-context Iron Age period resources identified, if any, would be NCW. Thus, it is considered that there would be no negative impact on these resources.

Nature of Impact	Significance Before Mitigation		Significance After Mitigation		Significance Before Mitigation		Significance After Mitigation	
	Historical/colonial period resources: <b>Neutral</b>	Construction Phase				Operational Phase		
Extent		Low	Extent	Low	Extent	Low	Extent	Low
Duration		Low	Duration	Low	Duration	Low	Duration	Low
Severity		Low	Severity	Low	Severity	Low	Severity	Low

	Probability	Low	Probability	Low	Probability	Low	Probability	Low
	Significance	Low	Significance	Low	Significance	Low	Significance	Low
can be reversed?								No
may cause irreplaceable loss of resources?								No
can be avoided, managed, or mitigated?								Yes
the degree to which the impact and risk can be reversed?								Neutral
the degree to which the impact and risk may cause irreplaceable loss of resources?								Neutral
the degree to which the impact and risk can be avoided, managed, or mitigated?								Neutral
Cumulative Impact								Low (Neutral)
It is anticipated that any out-of-context Historical/Colonial period resources identified, if any, would be NCW. Thus, it is considered that there would be no negative impact on these resources.								

Nature of Impact	Significance Before Mitigation		Significance After Mitigation		Significance Before Mitigation		Significance After Mitigation	
	<b>Graves: Negative</b>	Construction Phase				Operational Phase		
	Extent	High	Extent	Low	Extent	High	Extent	Low
	Duration	High	Duration	Low	Duration	High	Duration	Low
	Severity	High	Severity	Low	Severity	High	Severity	Low
	Probability	High	Probability	Low	Probability	High	Probability	Low
	Significance	High	Significance	Low	Significance	High	Significance	Low
can be reversed?								No
may cause irreplaceable loss of resources?								Yes
can be avoided, managed, or mitigated?								Yes
the degree to which the impact and risk can be reversed?								Negative
the degree to which the impact and risk may cause irreplaceable loss of resources?								Negative
the degree to which the impact and risk can be avoided, managed, or mitigated?								Positive
Cumulative Impact								High (Negative)
Graves are generally given a field rating of (IIIB or IIIA) medium to high sensitivity. It is generally recommended that graves/cemeteries and/or burials be mitigated, either through a buffer/safety zone of 50 m with fencing or by grave relocation is recommended if graves cannot be avoided by construction.								

## 7.2 Possible Mitigation Measures

Based on the assessment of the potential impact of the development on possible heritage, possible mitigations include:

- Any archaeological material identified as not conservation worthy (NCW) is generally considered low significance and does not require any additional mitigation other than a Phase 1 HIA.
- In the event hidden or sub-surface sites (i.e. 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 uncovered 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.
- A rudimentary Chance find protocol (APPENDIX A) has been added to this report to aid the developer.
  
- Graves should be avoided. Therefore, if graves are identified in the proposed development footprints, the mitigation measures can include the following:
  - A safety/Buffer zone of 50m, with fencing.
  - The care, upkeep, upgrading, reinforcing and management of all graves by the developer.
  - If any graves/graveyards/cemeteries are discovered, and development cannot be avoided near the graves, we recommend a Phase 2 HIA for the rescue and relocation of the graves. Permits and all actions should be in place following the NHRA.
  - If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490) must be alerted immediately as per section 36(6) of the NHRA. Depending on the nature of the finds, a professional archaeologist or palaeontologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources are of archaeological or palaeontological significance, a Phase 2 rescue operation may be required, subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.





## 8. RECOMMENDATIONS

This scoping study has revealed that various heritage sites occur in the wider region. Every site is relevant to the Heritage Landscape. These recommendations are based on studies undertaken in the broader area of the proposed development. The following conclusions apply:

1. The scoping report has revealed several Stone Age occurrences/sites have been recorded in the wider region. However, no Stone Age resources have been identified near the proposed development. **The possibility of open-air Stone Age sites/occurrences in the development area is considered improbable.** However, suppose archaeological/heritage occurrences are present, such occurrences are expected to be of **low significance, out of context** and thus Non-Conservation Worthy (NCW) based on evidence from the surrounding landscape and agricultural activities and surface disturbance.
2. Rock art has been reported in the wider region. However, no rock art has been identified within the immediate vicinity of the proposed development areas. **The probability of rock art being present on site is very low.**
3. Although numerous Iron Age sites have been recorded in the wider region, it is considered that the **presence of such sites in the proposed development would be improbable.** This conclusion is based on the fact that the property, Grootfontein RE/1/394, has been disturbed by agricultural activities. In the unlikely event surface material is present, they are expected to be out of context and, therefore, **of low significance.**
4. The presence of **cultural material relating to the historical/colonial period is considered to be low.** If such above-ground material is present, we believe it may be out of context due to the disturbed nature of the proposed development.
5. Formal and informal graveyards, as well as pre-colonial graves, occur widely across southern Africa. It is commonly recommended that these sites are preserved from development. Any graveyard(s), grave(s) or burial(s) found close to the proposed development footprint would likely be of High Local Significance. It is recommended that they are fenced off with the inclusion of a 50 m buffer/safety zone. We recommend the appointment of an on-site heritage officer during the development to monitor the safety of the graves during construction.
6. Should it be impossible to avoid graveyard(s), grave(s) or burial(s) sites during development, mitigation in the form of grave relocation could be undertaken. This is,



however, a lengthy and costly process. Grave relocation specialists should be employed to manage the liaison process with the communities and individuals who, by tradition or familial association, might have an interest in these graves or burial grounds, as well as manage the permit acquisition from the SAHRA Burial Grounds and Graves (BGG) Unit and the arrangements for the exhumation and re-interment of the contents of the graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

7. Limitations of this Desktop Scoping report are determined by the amount of information available on the South African Heritage Resources Information System (SAHRIS) and the clarity of satellite imaging. **Sub-surface archaeological sites, graves and informal cemeteries could be directly impacted during the proposed development.**
  
8. This scoping report estimates the probability of heritage sites/artefacts located on/near the development footprint based on available data. Due to the lack of heritage resources recorded near the proposed development areas and the current nature of human activity, the likelihood of archaeological sites/occurrences in the development area is considered improbable. We have, however, developed **a visual guide or rudimentary Chance Finds Protocol for this project (APPENDIX A). It is recommended that the developer refers to it during development.** We recommend exempting the project from a complete AIA study with field assessment. **This is, however, subject to agreement by the South African Heritage Resources Agency.**
  
9. This scoping report reflects the specialists' estimation of the likely impacts that may occur on said resources by the proposed development. The extent and significance of identified probable resources are unknown. **The final decision on whether the submission of a full impact assessment is required lies with the responsible heritage resources authorities, the South African Heritage Resources Agency (SAHRA) if there is reason to believe that heritage resources will be affected by construction activities and events.**
  
10. Hidden or sub-surface sites may exist in the area. No sub-surface testing may be conducted without a permit, and therefore sites may be missed during the field assessment. We recommend that if 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 uncovered during mining, 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 discovered, 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. A professional archaeologist or palaeontologist must be contracted as soon as possible to inspect the findings. If the newly unearthed heritage resources are of high significance, a Phase 2 rescue operation may be required with permits issued by SAHRA. UBIQUE Heritage Consultants

and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

11. The Palaeontological Impact Assessment indicates that the proposed site lies on the potentially fossiliferous Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) that might preserve trace fossils such as stromatolites or microbialites. It is therefore recommended that:

- a **Fossil Chance Find Protocol should be added to the EMPr.**
- Based on this information, it is recommended that **no further palaeontological impact assessment is required** unless fossils are found by the contractor, environmental officer or other designated responsible person once excavations for foundations, infrastructure and amenities have commenced. Since the **impact will be low, the project should be authorised as far as palaeontology is concerned.**



## 9. CONCLUSION

In conclusion, the scoping report has revealed that no Heritage and Archaeological Impact Assessments have been done on the proposed development area. However, heritage sites and resources ranging from low to high significance have been documented on the periphery of a 5-150 km radius from the study area. These sites provide the reader with the data necessary to anticipate the sites' probable significance that might accompany any projected heritage resources.

The heritage resources in the wider area range from Stone Age scatters, Iron Age sites, rock art and sites containing Historical/Colonial-era resources. Based on the nature of the agricultural disturbance, and that little to no archaeological and cultural resources have been identified near the proposed development footprint, and the overall low heritage sensitivity (according to the DFFE screening tool), it is anticipated that there is a low probability of significant heritage resources being present on the proposed development area and that no archaeological or cultural resources will be impacted negatively by development. Moreover, the likelihood of graves and/or burials being present on site is low. However, the probability of sub-surface graves/burials should not be disregarded since graves and informal cemeteries can be expected anywhere in the landscape. If any graves are present, they will be impacted negatively by development.

We recommend exempting the proposed project from a complete HIA study with field assessment. This is, however, subject to agreement by the South African Heritage Resources Agency. We also recommend that it may continue provided the recommendations stipulated within this report, and the subsequent decision by SARHA, are followed.



## 10. BIBLIOGRAPHY

- Celliers, J. 2018. Phase 1 Archaeological and Heritage Impact Assessment on the Remainder of Portion 186 of the farm Tiegerpoort 371 JR in respect of a proposed hospitality development, City of Tshwane, Gauteng Province. Unpublished report. Kudzala Antiquity: Mpumalanga.
- Deacon, H.J. & Deacon, J. 1999. Human Beginnings in South Africa: Uncovering the secrets of the Stone Age. David Phillips Publishers: Cape Town.
- Dreyer, C. 2006. First Phase Archaeological And Cultural Heritage Assessment Of The Proposed Feedlot Extensions At Elandsfontein 412IR, Heidelberg, Gauteng Province. Unpublished Report. Bloemfontein.
- Gaigher, S. 2017. Phase 1 Heritage Impact Assessment Report Heritage Impact Assessment for the Proposed Development of the Mooikloof Filling Station and Associated Infrastructure on Portion 1 on the Remainder of Portion 672 of the Farm Rietfontein 375-JR, within the City of Tshwane Metropolitan Municipality, Gauteng Province. Unpublished report. G&A Heritage Management Consultants: Louis Trichardt.
- Küsel, U. 2007. Cultural Heritage Resources Impact Assessment Of Portion 9 Of The Farm Grootfontein 394 Jr Tshwane Gauteng. Unpublished report. African Heritage Consultants CC: Pretoria.
- Küsel, U. 2012 Cultural Heritage Resources Impact Assessment Of The Proposed Extension Of Midrand Estate Portions 35, 39, A Portion Of Portion 48 And 128, Remainder Of Portion 34 And The Remainder Of The Farm Olifantsfontein 410 Jr Ekurhuleni Gauteng. Unpublished Report. African Heritage Consultants Cc: Pretoria.
- Kaplan, J. 2002. Phase 1 archaeological study a portion of the farm Hollandsebos clanwilliam. Unpublished report. Agency for Cultural Resources Management: Riebeeck West.
- Mitchell, P. 2002. The archaeology of Southern Africa. Cambridge: Cambridge University Press
- Pelser, A. 2018. A Report On A Hia Related To A Grave Site Relocation Project For The Strawberry Farm Township Development Located On A Portion (Ptn 14) Of The Farm Olifantsfontein 402jr Olifantsfontein/Irene/Clayville Area, Gauteng. Unpublished Report. A Pelser Archaeological Consulting: Pretoria.
- Roodt, F. 2002. Heritage Impact Assessment A Desktop Study Proposed Expansion Of An Existing Hatchery Facility On Portion 152 Of Tiegerpoort 371 Jr Within City Of Tshwane Metropolitan Municipality, Gauteng Province. Unpublished Report. Vhufa Hashu Heritage Consultants Cc: Limpopo.
- Van Schalkwyk, J. 2002 A. A Survey Of Cultural Resources On The Farm Olifantsfontein, Midrand Municipal Area, Gauteng Province. Unpublished Report. National Cultural History Museum: Pretoria.
- Van Schalkwyk, J. 2002 B. A Survey Of Cultural Resources For The Construction Of A Sewer Pipeline, Mooikloof Area, Pretoria District, Gauteng Province. Unpublished Report. National Cultural History Museum: Pretoria.
- Van Schalkwyk, J. 2007. Heritage Impact Assessment For The Planned Rietvallei 180iq Development, Krugerdorp Municipal District, Gauteng Province. Unpublished Report. Pretoria.
- Van Schalkwyk, J. 2015. Heritage Impact Assessment For The Proposed Installation Of A Bulk Water Pipeline In The Mooikloof Region Of Pretoria East, Gauteng Province. Unpublished report. Pretoria.
- Van Schalkwyk, J. 2017. Phase 1 Cultural Heritage Impact Assessment: The Proposed Emerald Valley Estate, Rietvalleirand Extension 80, Holding 72, Waterkloof Agricultural Holdings, City Of Tshwane Metropolitan Municipality, Gauteng Province. Unpublished Report. Pretoria.
- Van Schalkwyk, J. 2023. Phase 1 Cultural Heritage Impact Assessment: Section 24g Process: Unlawful Construction And Infilling Of A Watercourse On The Remainder Of Portion 274 Of The Farm Tiegerpoort 371jr, City Of Tshwane Metropolitan Municipality, Gauteng Province. Unpublished Report. Pretoria.

## WEB

<https://sahris.sahra.org.za/declaredsites> (Accessed 04/07/2023).

<https://sahris.sahra.org.za/allsitesfinder> (Accessed 04/07/2023).

<https://screening.environment.gov.za/> (Accessed 04/07/2023).

<https://sahris.sahra.org.za/map/palaeo> (Accessed 04/07/2023).

<https://digitalcollections.lib.uct.ac.za/> (Accessed 04/07/2023).

SAHO 2018 <https://www.sahistory.org.za/article/prehistory-pretoria-area> (Accessed 04/07/2023).



# APPENDIX A

CHANCE FIND PROTOCOL.



## CHANCE FIND PROTOCOL

The following section aims to assist the developer in identifying and managing heritage resources during development proactively. The Chance Find Protocol is not intended to replace heritage assessment or site interpretation. However, it is a visual guide of the most recognisable heritage resources expected in the study area, based on the results of the Desktop Study.

### STONE AGE FINDS

We can assume that stone tools dating from the ESA, MSA, and LSA may be present within the study area. Low-density (low-density =< 10 lithics per m<sup>2</sup>; high-density => 10 lithics per m<sup>2</sup>) open-air surface scatters are the most common lithic occurrence documented by previous HIA/AIAs within the region.

Stone tools can be present in sediments near rivers, pans, or elevated outcrops and rock shelters around water sources. Stone Age debris is also commonly found around drainage lines and exposed surfaces. Stone tools comprise any lithic material that has been shaped or flaked by cognisant anthropogenic activity. These include informal lithics like flakes or knapping waste or formally shaped tools like retouched flakes, scrapers, blades and handaxes.

The Later Stone Age period included coarse low-fired earthenware associated with the lithics. In addition, upper and lower grindstones might be present on settlement sites.



**Figure 13** Selection of various formal and informal ESA, MSA, and LSA stone tools. LSA lithics may be accompanied by coarse low-fired earthenware. Photos: UBIQUE Heritage Consultants.



## CHANCE FIND PROTOCOL

### ROCK ART FINDS

Rock art can be present in open-air sites and shelters such as rock overhangs and caves. The conditions in shelters and caves are more conducive to the preservation of painted rock art, whereas engravings and petroglyphs are more likely to survive in open-air sites. In the study area, the presence of open-air sites might be more likely.

Different groups throughout southern Africa have left their mark on rocks. From Khoi-San and African groups depicting animals and scenes from their environment to travellers, settlers, missionaries and soldiers, writing their initials, names and dates, and drawings of flags, figures, and even a checkers/chessboard has been recorded.



**Figure 2** Examples of rock art and historical graffiti. Photos: UBIQUE Heritage Consultants.



## CHANCE FIND PROTOCOL

### IRON AGE FINDS

Iron Age settlement sites characteristically have circular scalloped stone-walled enclosures, livestock kraals and circular house structures. Generally, artefacts can be found around/inside the circular structures.

Middens are rubbish dumps associated with the remains of structures. More extensive communal middens are often present at Iron Age Sites. Middens are identifiable by ash deposits and concentrations of artefacts such as earthenware pottery, glass, clay, and Ostrich Eggshell (OES) beads and fresh-water shell beads, as well as faunal material. In addition, upper and lower grindstones might be present on the surface.



**Figure 3** Iron Age house structures, livestock kraals, upper grindstone, in situ potsherds, surface scatter potsherds and beads. Photos: UBIQUE Heritage Consultants.



# CHANCE FIND PROTOCOL

## HISTORICAL PERIOD FINDS

The Historical Period manifests within the landscape as a variety of different features. For example, sites can vary from permanent settlements like farmscapes or ephemeral like military encampments. Any structure older than 60 years falls under the purview of the NHRA and should be assessed for its unique significance. Structures' construction can range from fieldstone, low-fired mud brick, or bricks and concrete.

Middens, or rubbish dumps, associated with structures or an encampment site can hold valuable archaeological information. Middens are identifiable in the landscape by ash deposits and concentrated surface distribution of artefacts, such as glass, ceramics, and metal.



Figure 4 Various Historical structures. Photos: UBIQUE Heritage Consultants.



## CHANCE FIND PROTOCOL



Figure 5 Various Historical artefacts (i-o). Photos: UBIQUE Heritage Consultants.

## GRAVES

Graves and informal cemeteries can be expected anywhere in the landscape. For example, family cemeteries can be close to farmsteads, while informal graves with fieldstone cairns or headstones could also be located seemingly random in the veldt. Formal graves are easy to identify; however, fieldstone graves could become barely recognisable for numerous reasons over time. Grave treatment ranges from marble, fieldstone, cement/concrete, and bricks.

It is important to note that not all burials are visible on the surface, and those grave indicators may have been displaced. The unexpected excavation of sub-surface human remains is a rare but probable scenario.

Should it be impossible to avoid graveyard(s), grave(s) or burial(s) sites with the final development, mitigation in the form of grave relocation could be undertaken. This is, however, a lengthy and costly process. Grave relocation specialists need to be employed to manage the liaison process with the communities and individuals who by tradition or familial association might be interested in these graves or burial grounds. They will manage the permit acquisition from the SAHRA Burial Grounds and Graves (BGG) Unit and the arrangements for the exhumation and re-interment of the contents of the graves.



## CHANCE FIND PROTOCOL



Figure 6 Various grave treatments, formal and informal. Photos: UBIQUE Heritage Consultants.

### WHAT TO DO

Hidden or sub-surface sites may exist in the area. Sub-surface testing cannot be conducted without a permit, and therefore sites may be missed during a field assessment.

Suppose any evidence of archaeological sites as discussed or other heritage resources are uncovered during development, the development activities should halt. SAHRA's APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted per section 35(3) of the NHRA. In addition, if unmarked human burials are discovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase 012 941 4960) must be alerted immediately as per section 36(6) of the NHRA.

A professional archaeologist or palaeontologist must be contracted as soon as possible to inspect the findings. If the newly unearthed heritage resources are of high significance, a Phase 2 rescue operation may be required with permits issued by SAHRA.

Contact UBIQUE Heritage Consultants: [info@ubiquecrm.com](mailto:info@ubiquecrm.com) / [heidi@ubiquecrm.com](mailto:heidi@ubiquecrm.com) / [jan@ubiquecrm.com](mailto:jan@ubiquecrm.com)



# APPENDIX B

PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED RESIDENTIAL DEVELOPMENT ON PTN 8 AND REM OF PTN 1, FARM GROOTFONTEIN 394 JR, GAUTENG PROVINCE.

**Palaeontological Impact Assessment for the  
proposed residential Development on Ptn 8 and  
Rem of Ptn 1, Farm Grootfontein 394 JR,  
Gauteng Province**

**Desktop Study (Phase 1)**

**For**

**GKM Environmental**

**04 June 2023**

**Prof Marion Bamford**

Palaeobotanist

P Bag 652, WITS 2050

Johannesburg, South Africa

[Marion.bamford@wits.ac.za](mailto:Marion.bamford@wits.ac.za)

## **Expertise of Specialist**

The Palaeontologist Consultant: Prof Marion Bamford  
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf, PSSA  
Experience: 34 years research and lecturing in Palaeontology  
26 years PIA studies and over 350 projects completed

## **Declaration of Independence**

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by GKM Environmental, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

A handwritten signature in blue ink that reads "MKBamford". The signature is written in a cursive style and is positioned above a horizontal line.

Signature:



## **Executive Summary**

A Palaeontological Impact Assessment was requested for the proposed residential development on the Portion 8 and the Remainder of Portion 1 of Farm Grootfontein 394 JR, southeast of Pretoria, Gauteng Province.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies on the potentially fossiliferous Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) that might preserve trace fossils such as stromatolites or microbialites. Therefore, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, environmental officer or other designated responsible person once excavations for foundations, infrastructure and amenities have commenced. Since the impact will be low, as far as the palaeontology is concerned, the project should be authorised.

## Table of Contents

Expertise of Specialist .....	1
Declaration of Independence .....	1
1. Background .....	4
2. Methods and Terms of Reference.....	7
3. Geology and Palaeontology.....	8
i. Project location and geological context .....	8
ii. Palaeontological context.....	10
4. Impact assessment.....	13
5. Assumptions and uncertainties.....	14
6. Recommendation.....	15
7. References .....	15
8. Chance Find Protocol .....	17
9. Appendix A – Examples of fossils .....	18
10. Appendix B – Details of specialist.....	19
Figure 1: Google Earth map of the general area to show the relative land marks. ....	6
Figure 2: site location map of the proposed development .....	7
Figure 3: Geological map of the area around the project site.....	8
Figure 4: SAHRIS palaeosensitivity map for the site .....	11

# 1. Background

This report is for the proposed residential development on Portion 8 and the Remainder of Portion 1 of Farm Grootfontein 394 JR. The project involves.....

The site is southeast of Pretoria and northwest of Bapsfontein and is surrounded by the existing Grootfontein Country Estate to the north, the Rietfontein residential area to the east and the Blue Crane Estate to the south (Figures 1-2). At present the land is under agriculture with some irrigated fields.

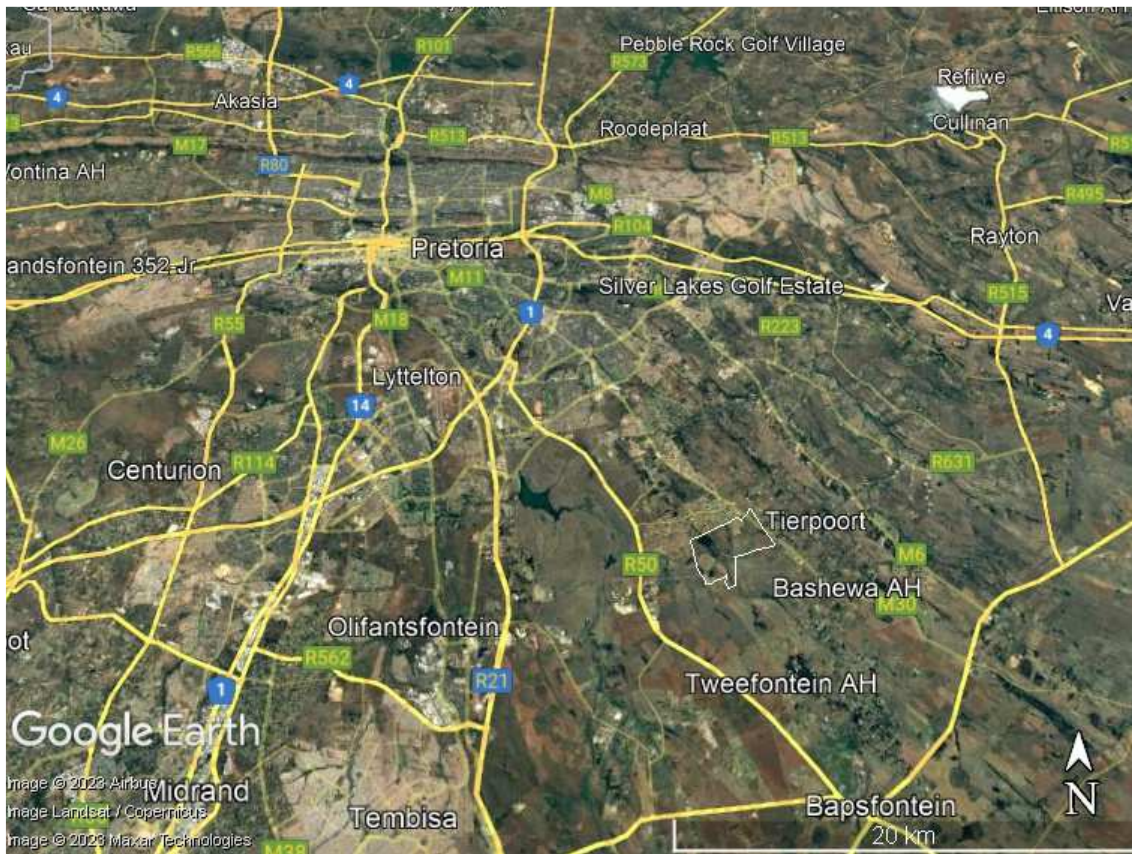
A Palaeontological Impact Assessment was requested for the Grootfontein development project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

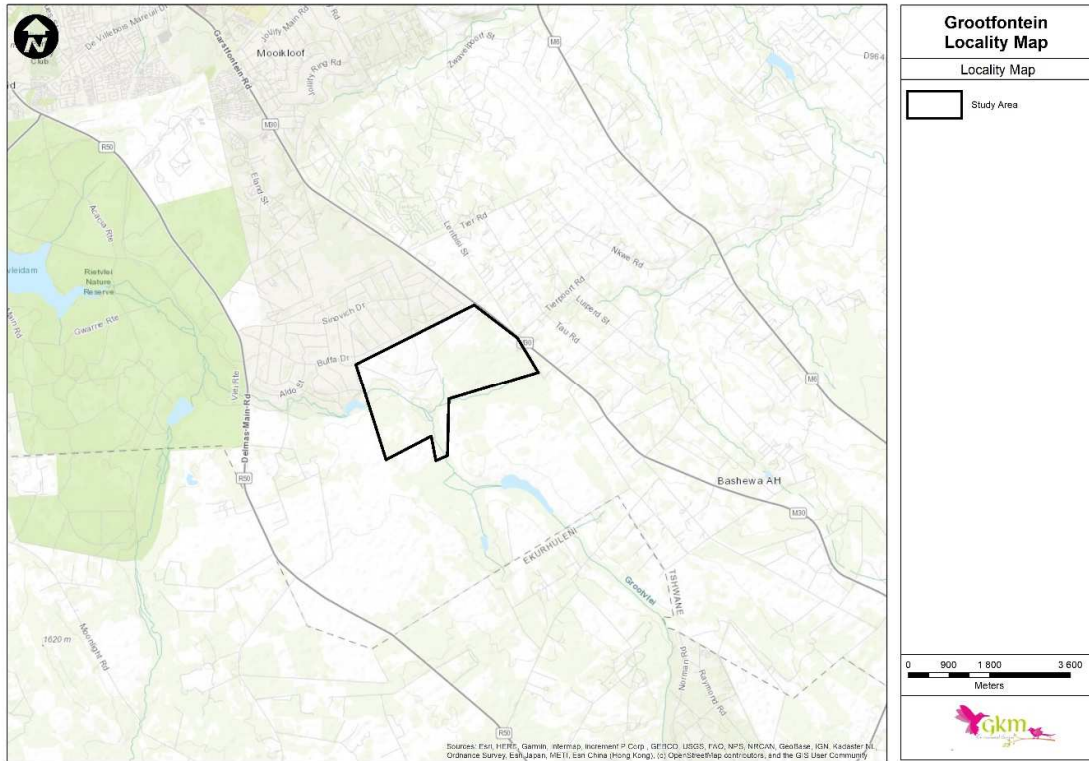
	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A

	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
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;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
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 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity 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	Sections 6, 8
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 of 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 gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A





**Figure 1: Google Earth map of the general area to show the relative towns and landmarks. The Grootfontein project is shown by the white polygon.**



**Figure 2: Site location map of the proposed development on Farm Grootfontein 394 JR shown by the black outline. Map supplied by GKM Environmental.**

## 2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources include records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).



### 3. Geology and Palaeontology

#### i. Project location and geological context



**Figure 3: Geological map of the area around the farm Grootfontein 394 JR. The location of the proposed project is indicated within the yellow polygon. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2528 Pretoria.**

Table 2: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006. Johnson et al., 2006; Zeh et al., 2020). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Pe	Ecca Group, Karoo SG (probably Vryheid Fm)	Shale, mudstone, sandstone, coal seams in places	Early Permian
Pd	Dwyka Group, Karoo SG	Diamictite, tillite, mudstone, sandstone	Late Carboniferous to Early Permian
Vdi	Diabase	Intrusive volcanic dykes and sills	Post Transvaal SG
Vdq	Daspoort Fm, Pretoria Group, Transvaal SG	Quartzite	<2240 Ma

Symbol	Group/Formation	Lithology	Approximate Age
Vst	Strubenkop Fm, Pretoria Group, Transvaal SG	Shale, in places ferruginous	Ca 2242 Ma
Vha	Hekpoort Fm, Pretoria Group, Transvaal SG	Volcanic rocks	Ca 2224 Ma
Vb	Boshoek Fm, Pretoria Group, Transvaal SG	Quartzite	Ca 2266 Ma
Vt	Timeball Hill Fm, Pretoria Group, Transvaal SG	Shale, siltstone, conglomerate in places; dotted = Quartzite	Ca 2316 – 2266 Ma
Vd	Duitschland Fm, Chuniespoort Group, Transvaal SG	Conglomerate	<2343 Ma
Vmd	Malmani Subgroup, Transvaal SG	Dolomite, chert	Ca 2343 Ma

The project lies in the Transvaal Basin of the Transvaal Supergroup and in parts is unconformably overlain by much younger rocks of the basal Karoo Supergroup (Figure 3).

The Late Archaean to early Proterozoic Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton (Eriksson et al., 2006). In South Africa are the Transvaal and Griqualand West Basins, and the Kanye Basin is in southern Botswana. The Griqualand West Basin is divided into the Ghaap Plateau sub-basin and the Prieska sub-basin. Sediments in the lower parts of the basins are very similar but they differ somewhat higher up the sequences. Several tectonic events have greatly deformed the south western portion of the Griqualand West Basin between the two sub-basins

The Transvaal Supergroup comprises one of world's earliest carbonate platform successions (Beukes, 1987; Eriksson et al., 2006; Zeh et al., 2020). In some areas there are well preserved stromatolites that are evidence of the photosynthetic activity of blue green bacteria and green algae. These microbes formed colonies in warm, shallow seas.

In the Transvaal Basin the Transvaal Supergroup is divided into two Groups, the lower Chuniespoort Group and the upper Pretoria Group (with ten formations; Eriksson et al., 2006). The Chuniespoort Group is divided into the basal **Malmani Subgroup** that comprises dolomites and limestones and is divided into five formations based on chert content, stromatolitic morphology, intercalated shales and erosion surfaces. The top of the Chuniespoort Group has the Penge Formation and the Duitschland Formation.

Making up the lower Pretoria Group are the **Timeball Hill** Formation and the Boshoek Formation. The Hekpoort, Dwaalheuwel, Strubenkop and Daspoort Formations form a sequence as the middle part of the Pretoria Group, Transvaal Supergroup, and represent rocks that are over 2060 million years old. The **Hekpoort Formation** is a massive lava deposit and is overlain by the Dwaalheuwel conglomerates, siltstone and sandstone (not present here). A hiatus separates the Strubenkop Formation slates and shales from the overlying quartzites of the Daspoort Formation. Upper Pretoria Group formations are the



Silverton, Magaliesberg, Vermont, Lakenvalei, Nederhorst, Steenkampsberg and Houtenbek Formations

The Transvaal sequence has been interpreted as three major cycles of basin infill and tectonic activity with the first deep basin sediments forming the Chuniespoort Group, the second cycle deposited the lower Pretoria Group, and the sediments in this area are from the interim lowstand that preceded the third cycle. These sediments were deposited in shallow lacustrine, alluvial fan and braided stream environments (Eriksson et al., 2012).

Overlying the Rooihoogte Formation is the **Timeball Hill Formation** which is composed of thick shales and subordinate sandstones that were deposited in a fluvio-deltaic basin-filling sequence (Eriksson et al., 2006). A number of facies are included in this formation. At the base is black shale facies associated with subsurface lavas and pyroclastic rocks of the Bushy Bend Lava Member. Above these are rhythmically interbedded mudstones/siltstones and fine-grained sandstones that have been interpreted as turbidite deposits (Eriksson et al., 2006). These fine-grained sediments grade up into the medial Klapperkop Quartzite Member that has been interpreted as fluvio-deltaic sandstones which fed the more distal turbidites (ibid). Above this is an upper shale member and rhythmite facies. In the east of the Transvaal Basin the Upper Timeball Hill shales have undergone extensive soft-sediment deformation caused by the onset of tectonic instability that led to the eventual fan deposits of the Boshhoek Formation and the flood basalts of the Hekpoort Formation (ibid).

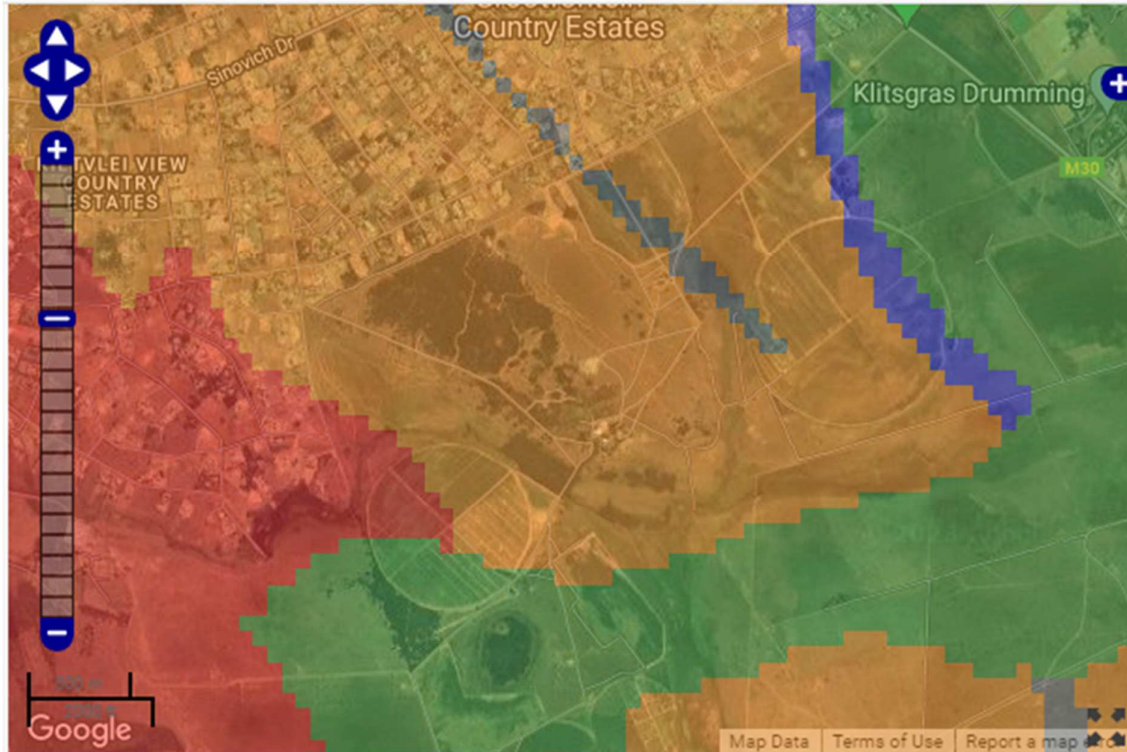
The **Hekpoort Formation** is composed of subaerial lavas that intruded into the Boshhoek sandstones. These basaltic-andesitic lavas are thickest in the south of the Transvaal basin, thinning to the west and thinnest in the northeast (Eriksson et al., 2006).

The **Strubenkop Formation** depositional setting has been interpreted as either a lacustrine one (Eriksson et al., 1991, 1993a) or a shallow marine one (Button, 1973a). This formation comprises alternating mudstones and siltstones with subordinate interbedded, immature, fine-grained sandstones and is generally upward-coarsening.

The northern part of the Karoo Basin with the Karoo Supergroup Sequence overlies the much older Transvaal Supergroup. At the base of the Karoo Supergroup is the **Dwyka Group** comprising the sediments that were deposited as the Late Carboniferous icesheets melted and dropped the debris that had been entrained within them. Overlying the Dwyka Groups are the strata of the Ecca Group, fluvial and lacustrine sediments that gradually filled the large Karoo inland sea. In this area the various formations are the basal **Vryheid Formation**, then the Volksrust Formation. The former includes a number of coal seams that were formed after the burial of the peats. The younger Karoo rocks do not occur in this area.

## ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The site for development is in the basal Transvaal Supergroup rocks and some of the basal Karoo Supergroup rocks.



**Figure 4: SAHRIS palaeosensitivity map for the site for the proposed Grootfontein residential development shown within the yellow polygon. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.**

The Transvaal Supergroup sequence of sedimentary and volcanic rocks has been interpreted as having undergone three cycles of tectonically controlled basin subsidence and infilling with clastic deposits from the west and northwest. The first cycle (Chuniespoort Group) was a shallow seaway in a marine environment where the carbonate platform (Malmani Subgroup) was deposited and has a variety of limestones and dolomite (Erikson et al., 2012). Occasionally stromatolites occur in the Malmani Subgroup within the dolomites (ibid) and these are protected by legislation.

The age of the lower **Timeball Hill Formation** is constrained at 2322–2316 Ma by Re–Os pyrite geochronology from black shales at its base (Figure 2; Bekker et al., 2004; Hannah et al., 2004). Tuff beds in the upper Timeball Hill Formation gave U–Pb ages of  $2256 \pm 6$  to  $2266 \pm 4$  Ma (Fig. 2; Rasmussen et al., 2013). The Timeball Hill Formation represents deltaic deposition in an intracratonic basin, with clastics sourced from the east to northeast (Coetzee et al., 2006). There are no records of fossils in the Timeball Hill Formation (Eriksson et al., 2006, 2012). The age of the sediments precedes the evolution of body fossils (Plumstead, 1969; Benton, 2005) so only micro-organisms would have evolved. Deepwater, turbidite and tuff beds are not settings that are conducive to the preservation of fossils, particularly small and fragile fossils. The SAHRIS interpretation, based on the Palaeotechnical report of Gauteng (Groenewald et al., 2014), is likely to be incorrect but is an assumption based on the occurrence of such fossils in other strata.

Bosch and Eriksson (2008) described crack-like features, vermiform structures and circular imprints resembling concretions or, possibly oncolites, that occur on sand sheet surfaces within the uppermost beds of the **Magaliesberg Formation**. They indicated two localities, one north of Pretoria, on the farm Baviaanspoort 330 JR and the other on the farm Rietvlei 518 JR, east of Pretoria. Leeuwoort is northeast of Pretoria. The presence of such microbial mat-like features are found in epeiric marine tidally dominated coastline. The rhythmic alternation of water levels inherent in such settings can explain desiccation of microbial mats growing on the sandy substrates formed within the palaeoenvironment. In addition, the shifting loci of deposition were probably also related to braided fluvial inputs, through the medium of braid deltas (Bosch and Eriksson, 2008).

**Stromatolites** are the trace fossils that were formed by colonies of green algae and blue-green algae (Cyanobacteria) that grew in warm, shallow marine settings. These algae were responsible for releasing oxygen via the photosynthetic process where atmospheric carbon dioxide and water, using energy from the sun, are converted into carbon chains and compounds that are the building blocks of all living organisms. The released carbon dioxide initially was taken up by the abundant reducing minerals to form oxides, e.g. iron oxide. Eventually free oxygen was released into the atmosphere and some was converted into ozone by the bombardment of cosmic rays. The ozone is critical for the filtering out of harmful ultraviolet rays.

Stromatolites are the layers upon layers of inorganic materials that were deposited during photosynthesis, namely calcium carbonate, magnesium carbonate, calcium sulphate and magnesium sulphate. These layers can be in the form of flat layers, domes or columns depending on the environment where they grew (Beukes, 1987). Some environments did not form stromatolites, just layers of limestone that later was converted to dolomite. The algae that formed the stromatolites are very rarely preserved, and they are microscopic so they can only be seen from thin sections studies under a petrographic microscope.

**Microbialites** (sensu Burne and Moore, 1987) are organo-sedimentary deposits formed from interaction between benthic microbial communities (BMCs) and detrital or chemical sediments. In addition, microbialites contrast with other biological sediments in that they are generally not composed of skeletal remains. Archean carbonates mostly consist of stromatolites. These platforms could have been the site of early O<sub>2</sub> production on our planet. Stromatolites are the laminated, organo-sedimentary, non-skeletal products of microbial communities, which may have included cyanobacteria, the first photosynthetic organisms to produce oxygen. Another type of trace fossil has been termed Microbially-induced sedimentary structures (MISS sensu Noffke et al., 2001) or simply 'fossil mats' (sensu Tice et al., 2011). These include swirls, rip-ups, crinkled surfaces and wrinkles that were formed by the mucus extruded by littoral algae or microbes and bound together sand particles. Davies et al. (2016) caution against the assumption that all such structures are microbially induced unless there is additional evidence for microbes in the palaeoenvironment.

Nonetheless, stromatolites and microbialites are accepted as trace fossils of algal colonies. MISS could be microbially or abiotically formed. The oldest stromatolites have

been recorded from the Barberton Supergroup that was deposited between 3.55 to ca. 3.20 Ga, and stromatolites still form today in warm, shallow seas (Homan, 2019).

There is a small section in the southwest of the project area that occurs on the Malmani Subgroup (Figures 3-4), however, from the satellite image (Figure 2), that area is very clearing cultivated and under circular irrigation. This means that the land will have been cleared of all rocks some decades ago, and no rocks means that there are no fossils remaining (if present in the first place). It can be assumed, therefore, that there are stromatolites in the project footprint.

The Dwyka Subgroup might contain fragmentary fossil wood of the early *Glossopteris* flora, invertebrate shells or fish bones that have been transported by the glaciers and deposited as they melted. Such occurrences are very rare and restricted to the mudstone facies (Johnson et al., 2006).

#### 4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

**Table 3a: Criteria for assessing impacts**

<b>PART A: DEFINITION AND CRITERIA</b>		
<b>Criteria for ranking of the SEVERITY/NATURE of environmental impacts</b>	<b>H</b>	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	<b>M</b>	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	<b>L</b>	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	<b>L+</b>	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	<b>M+</b>	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	<b>H+</b>	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
<b>Criteria for ranking the DURATION of impacts</b>	<b>L</b>	Quickly reversible. Less than the project life. Short term
	<b>M</b>	Reversible over time. Life of the project. Medium term
	<b>H</b>	Permanent. Beyond closure. Long term.
<b>Criteria for ranking the SPATIAL SCALE of impacts</b>	<b>L</b>	Localised - Within the site boundary.
	<b>M</b>	Fairly widespread – Beyond the site boundary. Local
	<b>H</b>	Widespread – Far beyond site boundary. Regional/ national
<b>PROBABILITY</b>	<b>H</b>	Definite/ Continuous



<b>(of exposure to impacts)</b>	<b>M</b>	Possible/ frequent
	<b>L</b>	Unlikely/ seldom

**Table 3b: Impact Assessment**

<b>PART B: Assessment</b>		
<b>SEVERITY/NATURE</b>	<b>H</b>	-
	<b>M</b>	-
	<b>L</b>	Soils do not preserve fossils; so far there are no records from the Timeball Hill Fm of trace fossils, plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be negligible
	<b>L+</b>	-
	<b>M+</b>	-
	<b>H+</b>	-
	<b>DURATION</b>	<b>L</b>
<b>M</b>		-
<b>H</b>		Where manifest, the impact will be permanent.
<b>SPATIAL SCALE</b>	<b>L</b>	Since the only possible fossils within the area would be trace fossils in the shales or dolomites, the spatial scale will be localised within the site boundary.
	<b>M</b>	-
	<b>H</b>	-
<b>PROBABILITY</b>	<b>H</b>	-
	<b>M</b>	-
	<b>L</b>	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area or in the agricultural land that has already been cleared of rocks. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are much too old to contain body fossils but might contain trace fossils of microbes. Furthermore, the land has been under cultivation for decades. Since there is an extremely small chance that fossils from the Malmani Subgroup or Timeball Hill Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

## 5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and only some contain trace fossils. The soils and sands of the Quaternary period would not preserve fossils. The potentially fossiliferous section in the

southwest corner, on the Malmani Subgroup, is under agriculture and has been cleared of rocks, therefore, it is extremely unlikely that any fossils would still occur there any longer.

## 6. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below ground in the Timeball Hill Formation or the highly disturbed Malmani Subgroup, so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for foundations, infrastructure or amenities have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be very low, so as far as the palaeontological heritage is concerned, the project should be authorised.

## 7. References

Bekker, A., Holland, H.D., Wang, P.-L., Rumble, D., Stein, H.J., Hannah, J.L., Coetzee, L.L., and Beukes, N.J. (2004). Dating the rise of atmospheric oxygen. *Nature*, 427, 117-120.

Bosch, P., Eriksson, P., 2008. A note on two occurrences of inferred microbial mat features preserved in the c. 2.1 Ga Magaliesberg Formation (Pretoria Group, Transvaal Supergroup) sandstones, near Pretoria, South Africa. *South African Journal of Geology* 111, 251-262.

Burne, R.V., Moore, L.S., 1987. Microbialites; organosedimentary deposits of benthic microbial communities. *Palaios* 2(3), 241-254.

Davies, N.S., Liu, A.G., Gibling, M.R., Miller, R.F., 2016. Resolving MISS conceptions and misconceptions: A geological approach to sedimentary surface textures generated by microbial and abiotic processes *Earth-Science Reviews* 154, 210–246.

Eriksson, P.G., Altermann, W., 1998. Eriksson, An overview of the geology of the Transvaal Supergroup dolomites (South Africa). *Environmental Geology* 36, 178-188.

Eriksson, P.G., Altermann, W., Hartzler, F.J., 2006. The Transvaal Supergroup and its precursors. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. pp 237-260.

Eriksson, P.G., Bartman, R., Catuneanu, O., Mazumder, R., Lenhardt, N., 2012. A case study of microbial mats-related features in coastal epeiric sandstones from the Palaeoproterozoic Pretoria Group, Transvaal Supergroup, Kaapvaal craton, South Africa;

the effect of preservation (reflecting sequence stratigraphic models) on the relationship between mat features and inferred palaeoenvironment. *Sedimentary Geology* 263, 67-75.

Groenewald, G., Groenewald, D., Groenewald, S., 2014. SAHRA Palaeotechnical Report. Palaeontological Heritage of Gauteng. 23 pages.

Hannah, J.L., Bekker, A., Stein, H.J., Markey, R.J., Holland, H.D., 2004. Primitive Os and 2316 Ma age for marine shale: implications for Paleoproterozoic glacial events and the rise of atmospheric oxygen. *Earth and Planetary Science Letters* 225, 43–Homann. M., 2019. Earliest life on Earth: Evidence from the Barberton Greenstone Belt, South Africa. *Earth Science Reviews* 196, 102888.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

Noffke, N., Gerdes, G., Klenke, T. and Krumbein, W.E. (2001). Microbially induced sedimentary structures – a new category within the classification of primary sedimentary structures. *Journal of Sedimentary Research*, A71, 649-656.

Parizot, M., Eriksson, P.G., Aifa, T., Sarkar, S., Banerjee, S., Catuneanu, O., Altermann, W., Bumby, A.J., Bordy, E.M., Rooy, J.L. and Boshoff, A.J. (2005). Suspected microbial mat-related crack-like sedimentary structures in the Palaeoproterozoic Magaliesberg Formation sandstones, South Africa. *Precambrian Research*, 138, 274-296.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Rasmussen, B., Fletcher, I.R., Muhling, J.R. 2013. Dating deposition and low-grade metamorphism by in situ U/Pb geochronology of titanite in the Paleoproterozoic Timeball Hill Formation, southern Africa. *Chemical Geology* 351, 29-39.

Schröder, S., Beukes, N.J., Armstrong, R.A., 2016. Detrital zircon constraints on the tectonostratigraphy of the Paleoproterozoic Pretoria Group, South Africa. *Precambrian Research* 278, 362 – 393.

Tice, M.M., Thornton, D.C.O., Pope, M.C., Olszewski, T.D., Gong, J., 2011. Archean microbial mat communities. *Annual Review of Earth and Planetary Sciences* 39, 297–319.

Truswell, J.F., Eriksson, K.A., 1973. Stromatolitic associations and their palaeo-environmental significance: a reappraisal of a lower Proterozoic locality from the northern Cape Province, South Africa. *Sedimentary Geology* 10, 1–23.

Zeh, A., Wilson, A.H., Gerdes, A., 2020. Zircon U-Pb-Hf isotope systematics of Transvaal Supergroup – Constraints for the geodynamic evolution of the Kaapvaal Craton and its hinterland between 2.65 and 2.06 Ga. *Precambrian Research* 345, 105760.  
<https://doi.org/10.1016/j.precamres.2020.105760>

## 8. Chance Find Protocol

### **Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.**

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone or coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the trace fossils such as stromatolites or microbially features (trails, curls, rip-ups, mudcracks) trace fossils in the dolomites, limestones, shales and mudstones (for example see Figures 5-6). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.



9. Appendix A – Examples of fossils from the Pretoria Group



Weathering of dolomite



Small domal stromatolites

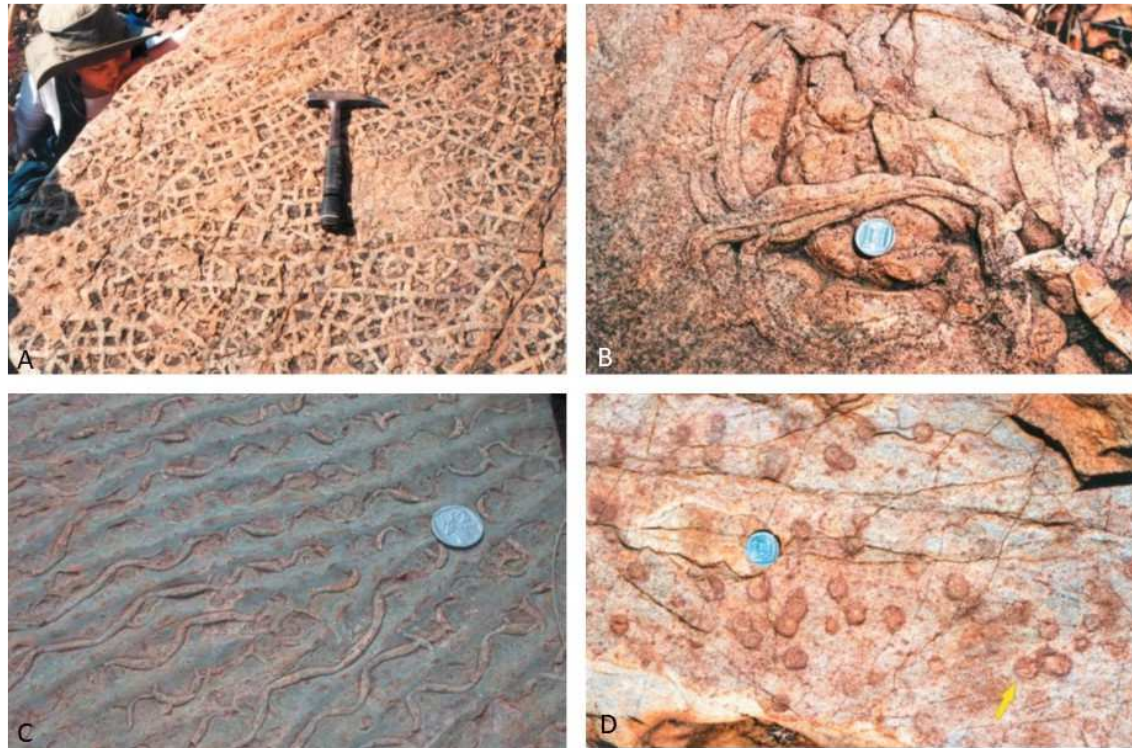


Side view of a stromatolite



Surface view of domal stromatolites

**Figure 5: Photographs from the Malmani Subgroup of different types of stromatolites in dolomite.**



Magaliesberg Fm trace fossils, near Pretoria (all from Bosch & Eriksson, 2008): A – cracks, B – sinuous structure, C – *Manchuriphyucus*, D – circular structures. R1 coin for scale.

**Figure 6: Photographs of microbial features from the Magaliesberg Formation (in Bosch and Eriksson, 2008)**

## 10. Appendix B – Details of specialist

### **Curriculum vitae (short) - Marion Bamford PhD January 2023**

Present employment: Professor; Director of the Evolutionary Studies Institute.  
Member Management Committee of the NRF/DSI Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa

Telephone : +27 11 717 6690  
Cell : 082 555 6937  
E-mail : [marion.bamford@wits.ac.za](mailto:marion.bamford@wits.ac.za) ;  
[marionbamford12@gmail.com](mailto:marionbamford12@gmail.com)

#### ii) **Academic qualifications**

Tertiary Education: All at the University of the Witwatersrand:  
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.  
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.

1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.

1986-1989: PhD in Palaeobotany. Graduated in June 1990.

**iii) Professional qualifications**

*Wood Anatomy Training (overseas as nothing was available in South Africa):*

1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps

1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer

1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

**iv) Membership of professional bodies/associations**

Palaeontological Society of Southern Africa

Royal Society of Southern Africa - Fellow: 2006 onwards

Academy of Sciences of South Africa - Member: Oct 2014 onwards

International Association of Wood Anatomists - First enrolled: January 1991

International Organization of Palaeobotany – 1993+

Botanical Society of South Africa

South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016

SASQUA (South African Society for Quaternary Research) – 1997+

PAGES - 2008 –onwards: South African representative

ROCEEH / WAVE – 2008+

INQUA – PALCOMM – 2011+onwards

**v) Supervision of Higher Degrees**

All at Wits University

Degree	Graduated/completed	Current
Honours	13	0
Masters	13	3
PhD	13	7
Postdoctoral fellows	14	4

**vi) Undergraduate teaching**

Geology II – Palaeobotany GEOL2008 – average 65 students per year

Biology III – Palaeobotany APES3029 – average 25 students per year

Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology;

Micropalaeontology – average 12 - 20 students per year.

**vii) Editing and reviewing**

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 – Assistant editor

Guest Editor: *Quaternary International*: 2005 volume

Member of Board of Review: *Review of Palaeobotany and Palynology*: 2010 –

Associate Editor: *Cretaceous Research*: 2018-2020

Associate Editor: *Royal Society Open*: 2021 -

Review of manuscripts for ISI-listed journals: 30 local and international journals

**viii) Palaeontological Impact Assessments**

25 years' experience in PIA site and desktop projects

- Selected from recent projects only – list not complete:
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for Enviropro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe
- Glosam Mine 2022 for AHSA
- Wolf-Skilpad-Grassridge OHPL 2022 for Zutari
- Iziduli and Msenge WEFs 2022 for CTS Heritage
- Hendrina North and South WEFs & SEFs 2022 for Cabanga
- Dealesville-Springhaas SEFs 2022 for GIBB Environmental
- Vhuvhili and Mukondeleli SEFs 2022 for CSIR
- Chemwes & Stilfontein SEFs 2022 for CTS Heritage
- Equestria Exts housing 2022 for Beyond Heritage
- Zeerust Salene boreholes 2022 for Prescali
- Tsakane Sewer upgrade 2022 for Tsimba
- Transnet MPP inland and coastal 2022 for ENVASS
- Ruighoek PRA 2022 for SLR Consulting (Africa)
- Namli MRA Steinkopf 2022 for Beyond Heritage

**ix) Research Output**

Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 170 articles published; 5 submitted/in press; 14 book chapters.

Scopus h-index = 30; Google Scholar h-index = 39; -i10-index = 116 based on 6568 citations.

Conferences: numerous presentations at local and international conferences.