



PGS HERITAGE

HERITAGE IMPACT ASSESMENT REPORT, FOR THE PROPOSED KALGOLD EXPANSION PROJECT BETWEEN MAFIKENG AND VRYBURG, THE NORTH WEST PROVINCE.

Heritage Impact Assessment

Issue Date: 20 October 2021
Revision No.: 0.1
Project No.: 355HIA



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Declaration of Independence

I, Michelle Sachse, declare that –

General declaration:

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

Disclosure of Vested Interest

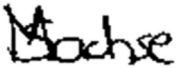


- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

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ACKNOWLEDGEMENT OF RECEIPT

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EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) which will serve to inform the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the proposed Kalgold Expansion Project (KEP) for Harmony Gold, in the Ratlou Local Municipality within the Ngaka Modiri Molema District Municipality, between Mafikeng and Vryburg, North West Province.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed development footprint of the Kalgold Expansion Project (KEP) for Harmony Gold. Immediate and direct impacts on archaeological and palaeontological resources were addressed through the HIA.

Site Name and Location

Kalgold Mine (Harmony Gold) is located in the Ratlou Local Municipality within the Ngaka Modiri Molema District Municipality, between Mafikeng and Vryburg in the North-West Province. At GPS co-ordinates: S -26.155870° E 25.236779°.

Fieldwork

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the study area. The fieldwork was conducted over several days from 11 October 2021 to 13 October 2021. This fieldwork team consisted of two archaeologists Michelle Sachse and Nicholas Fletcher. No archaeological sites or burial grounds and graves were identified during the fieldwork.

Impact Assessment

No evidence for any archaeological or heritage sites could be identified. As a result, no impact is expected from the proposed development on heritage.

Mitigation measures

With no impact expected on heritage, no further mitigation is required. Refer Chapter 8 of this report.

General

It is the author's considered opinion that the overall impact on heritage resources is Low. Provided that the recommended mitigation measures are implemented, the impact would be acceptably Low or could be totally mitigated to the degree that the project could be approved from a heritage perspective. The management and mitigation measures as described in section 8 of this report have been developed to minimise the project impact on heritage resources.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influences its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

Earlier Stone Age

The archaeology of the Stone Age between ~300 000 and 3 300 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

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

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

Holocene

The most recent geological time period which commenced 10 000 years ago.

Later Stone Age

The archaeology of the last 30 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Site

Site in this context refers to an area place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

Table 1 – List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
KEP	Kalgold Expansion Project
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
PIA	Palaeontological Impact Assessment
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SEA	Socio-Economic Assessment
SED	Socio-Economic Development
VIA	Visual Impact Assessment

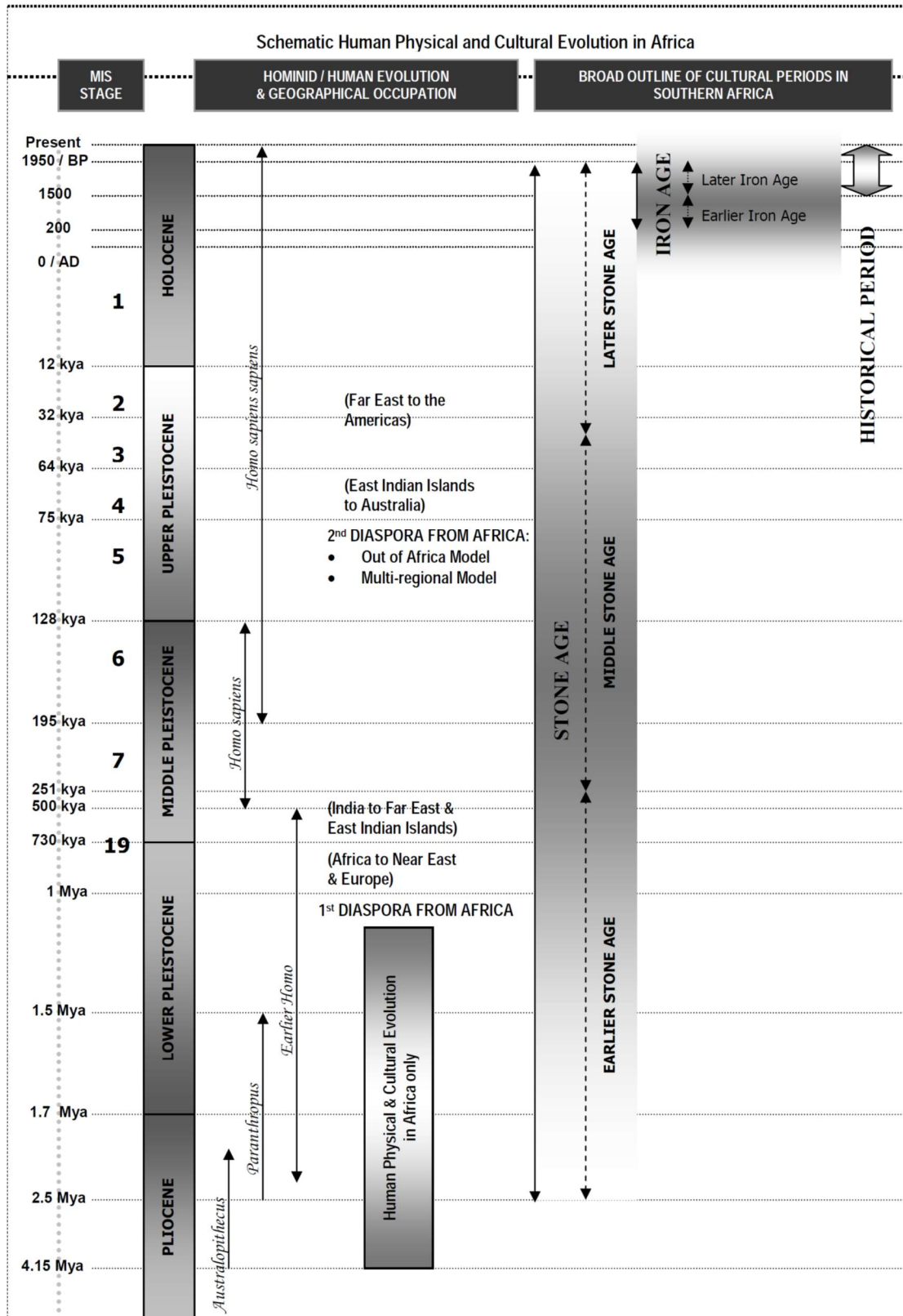


Figure 1 – Human and Cultural Timeline in Africa (Morris, 2008)

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) which will serve to inform the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the proposed Kalgold Mine Expansion (KEP) for Harmony Gold, Ratlou Local Municipality within the Ngaka Modiri Molema District Municipality, between Mafikeng and Vryburg, North West Province.

1.1 SCOPE OF THE STUDY

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area considered for the development of KEP. The HIA aims to inform the EIA in the development of a comprehensive EMPr to assist the project applicant in responsibly managing the identified heritage resources in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

1.2 SPECIALIST QUALIFICATIONS

This HIA was compiled by PGS.

The staff at PGS have a combined experience of nearly 90 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

Michelle Sachse, the author of this report, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist. She holds a Masters in Archaeology.

Nicholas Fletcher is a field archaeologist and the co-author for this report. He holds a BA (Hons) in Archaeology.

1.3 ASSUMPTIONS AND LIMITATIONS

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current vegetation cover. As such,

should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 IDENTIFICATION OF POLICIES, LEGISLATION, STANDARDS & GUIDELINES

1.4.1 STATUTORY FRAMEWORK: THE NATIONAL HERITAGE RESOURCES (ACT 25 OF 1999)

The NHRA has applicability, as the study forms part of an overall HIA in terms of the provisions of Section 34, 35, 36 and 38 of the NHRA and forms part of a heritage scoping study that serves to identify key heritage resources, informants, and issues relating to the palaeontological, archaeological, built environment and cultural landscape, as well as the need to address such issues during the impact assessment phase of the HIA process.

The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the SAHRA.

1.4.2 SECTION 3 - NATIONAL ESTATE

3) Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

- a) its importance in the community, or pattern of South Africa's history;
- b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;

- h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- i) sites of significance relating to the history of slavery in South Africa.

1.4.3 SECTION 34 – STRUCTURES

According to Section 34 of the NHRA, no person may alter, damage or destroy any structure, which forms part of the site's built environment older, that is 60 years without the necessary permits from the relevant provincial heritage authority.

1.1.1 Section 35 – Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the NHRA, Palaeontological Impact Assessments (PIA) is required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period.

1.1.2 Section 36 – Burial Grounds & Graves

A section 36 permit application is made to the SAHRA or the competent provincial heritage authority which protects burial grounds and graves that are older than 60 years and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the following conditions:

Permitting requirements for burial grounds and graves older than 60 years to the South African Heritage Resources Agency:

- a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves.
- b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; 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.
- d) 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.

1.1.3 Section 38 HIA as a Specialist Study within the EIA in terms of Section 38(8)

The NHRA Section 38 (Heritage Impact Assessments) application to ECPHRA is required when the proposed development triggers one or more of the following activities:

Permitting requirements for demolition of built environment features:

- a) the construction of a road, wall, power line, pipeline, canal or other similar forms of linear development or barrier exceeding 300m in length;
- b) the construction of a bridge or similar structure exceeding 50 m in length;
- c) any development or other activity which will change the character of a site,
 - i. exceeding 5 000 m² in extent; or
 - ii. involving three or more existing erven or subdivisions thereof; or
 - iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- d) the re-zoning of a site exceeding 10 000 m² in extent; or
- e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

In this instance, the heritage assessment for the property is to be undertaken as a component of the Environmental Impact Assessment (EIA) process for the project. Provision is made for this in terms of Section 38(8) of the NHRA, which states that:

An HIA report is required to identify, and assess archaeological resources as defined by the Act, assess the impact of the proposal on the said archaeological resources, review alternatives and recommend mitigation (see methodology above).

Section 38 (3) Impact Assessments are required, in terms of the statutory framework to conform to basic requirements as laid out in Section 38(3) of the NHRA. These are:

- The identification and mapping of heritage resources in the area affected
- The assessment of the significance of such resources
- The assessment of the impact of the development on the heritage resources
- An evaluation of the impact on the heritage resources relative to sustainable socio/economic benefits
- Consideration of alternatives if heritage resources are adversely impacted by the proposed development
- Consideration of alternatives
- Plans for mitigation in the future.

1.1.4 *Notice 648 of the Government Gazette 45421*

Although the minimum standard for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA, Government Notice (GN) 648 requires sensitivity verification for a site selected on the national web-based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this GN is listed in **Table 2** and the applicable section in this report noted.

Table 2 - Reporting requirements for GN648.

GN 648	Relevant section in report	Where not applicable in this report
2.2 (a) a desk top analysis, using satellite imagery;	Section 5	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Section 3	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;	Section 3	-
2.3(b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity;	Section 3 provides a description of the current use and confirms the status in the screening report	

An assessment of the Environmental Screening tool provides the following sensitivity ratings for archaeological and heritage resources as low to medium (**Figure 2**) and palaeontological resources as medium (**Figure 3**).

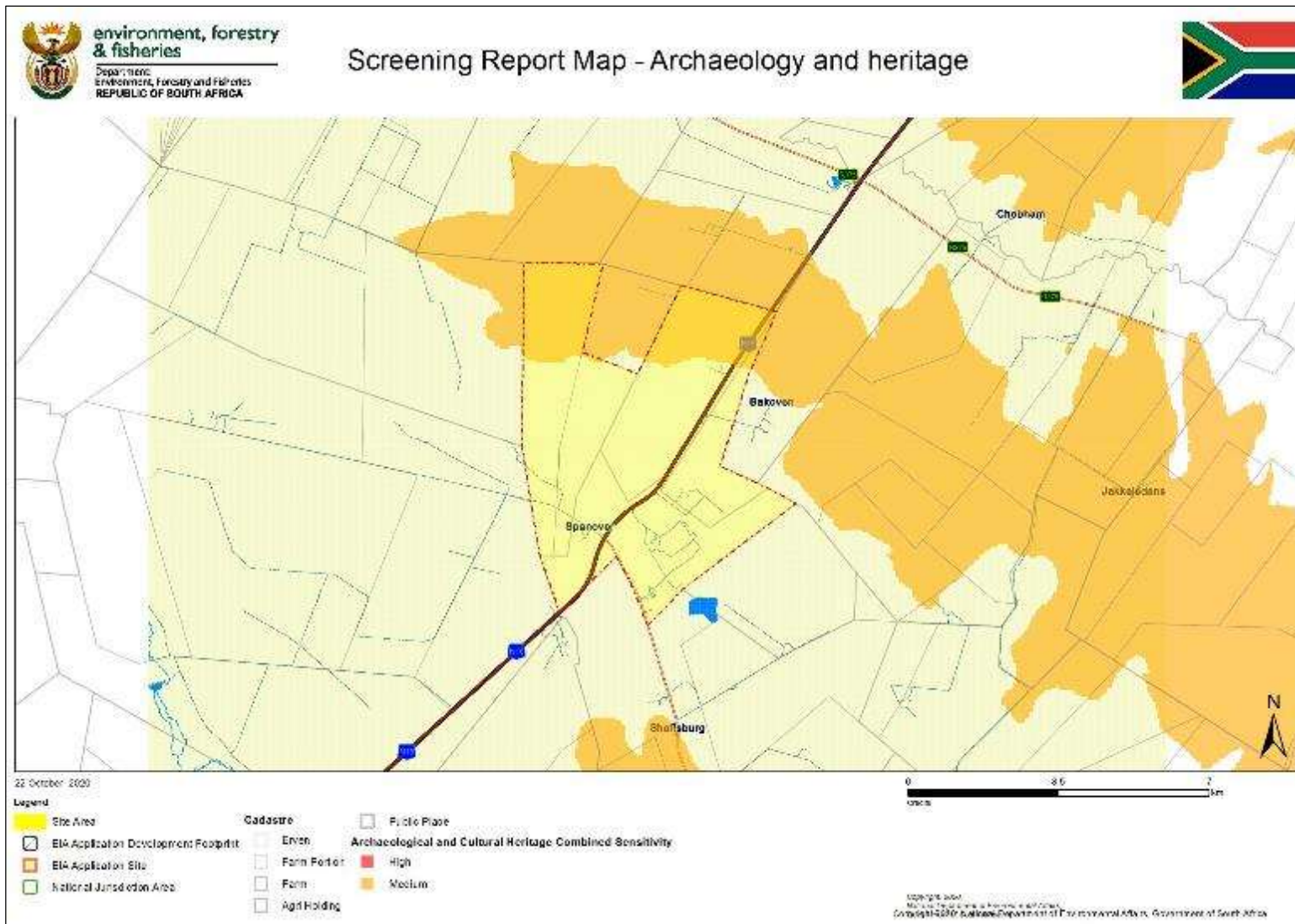


Figure 2 – Archaeology and Heritage screening map (Source: Department of Environmental Affairs).

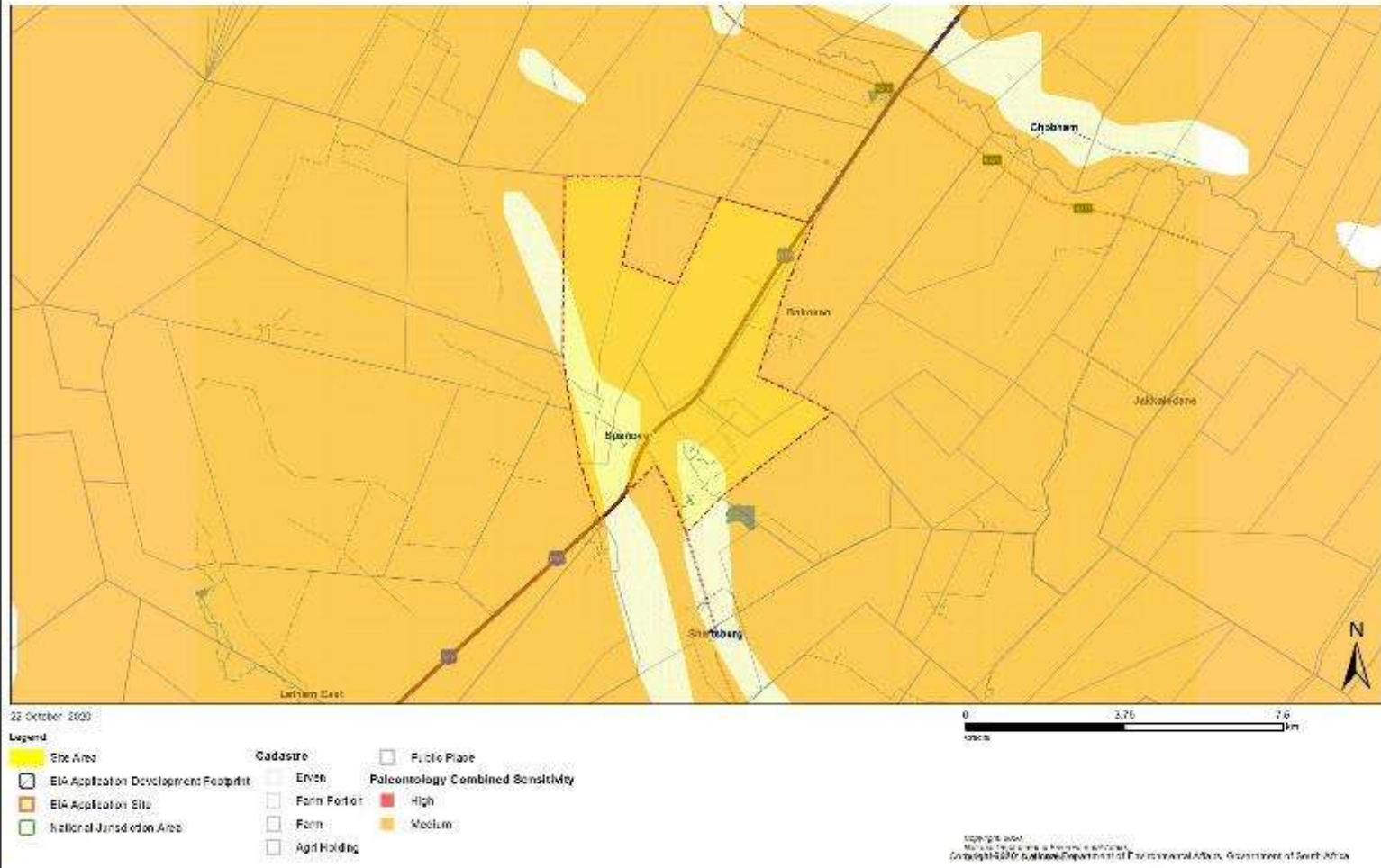


Figure 3 - Palaeontology screening map (Source: Department of Environmental Affairs).

1.4.4 NEMA – APPENDIX 6 REQUIREMENTS

The HIA report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) Appendix 6 requirements for specialist reports as indicated in the table below. For ease of reference, the table below provides cross-references to the report sections where these requirements have been addressed. It is important to note, that where something is not applicable to this HIA, this has been indicated in the table below.

Table 3 - Reporting requirements as per NEMA, as amended, Appendix 6 for specialist reports.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page 2 of Report – Contact details and company	-
(ii) The expertise of that person to compile a specialist report including a curriculum vitae	Section 1.2 – refer to Appendix B	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 3	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3 and 4	-
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 and Appendix A	-
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5	-
(g) An identification of any areas to be avoided, including buffers	Section 4	-
(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;	Figure 4 and Section 4	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3	-
(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 6, 7 and 8	
(k) Any mitigation measures for inclusion in the EMP	Section 4	
(l) Any conditions for inclusion in the environmental authorisation		Non required
(m) Any monitoring requirements for inclusion in the EMP or environmental authorisation	Section 4, 5 and 8	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 8	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		-
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan	Section 8	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study		Not applicable. A public consultation process was handled as part of the EIA and EMP process.
(p) A summary and copies if any comments that were received during any consultation process		Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.		Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	NEMA Appendix 6 and GN648 SAHRA guidelines on HIAs, PIAs and AIAs	-

2 SITE LOCATION AND DESCRIPTION

2.1 LOCALITY AND SITE DESCRIPTION

The existing opencast gold mining operation of Kalgold is situated in the Kraaipan Greenstone Belt some 60 kilometres southwest of Mahikeng in the jurisdiction of Ratlou Local Municipality within the Ngaka Modiri Molema District Municipality in the North West Province (**Figure 4 and Figure 5**).

The study area spans over four different farms. A portion of each farm has been surveyed where new development for the mine intends to take place

Study Area Coordinates	Northern Point S -26.121134° E 25.246467°	Eastern Point S -26.164429° E 25.279088°
	Southern Point S -26.184170° E 25.229827°	Western Point S -26.153210° E 25.221851°
Location	The study area is located within the Ratlou Local Municipality, in the Ngaka Modiri Molema District Municipality, North-West Province	
Property	Portions of Spanover 549 IO, Spanover 552 IO, Ferndale 554 IO and Goldridge 642 IO	
Topographic Map	2625AA -and 2625AB Camden	

The following infrastructure is encountered in the areas surveyed (**Figure 6 - Figure 11**):

- Provincial roads (N18);
- Mining infrastructure;
- Agricultural properties;
- Power lines.



Figure 4 - Locality map of the Kalgold Mine in proximity to Mafikeng.

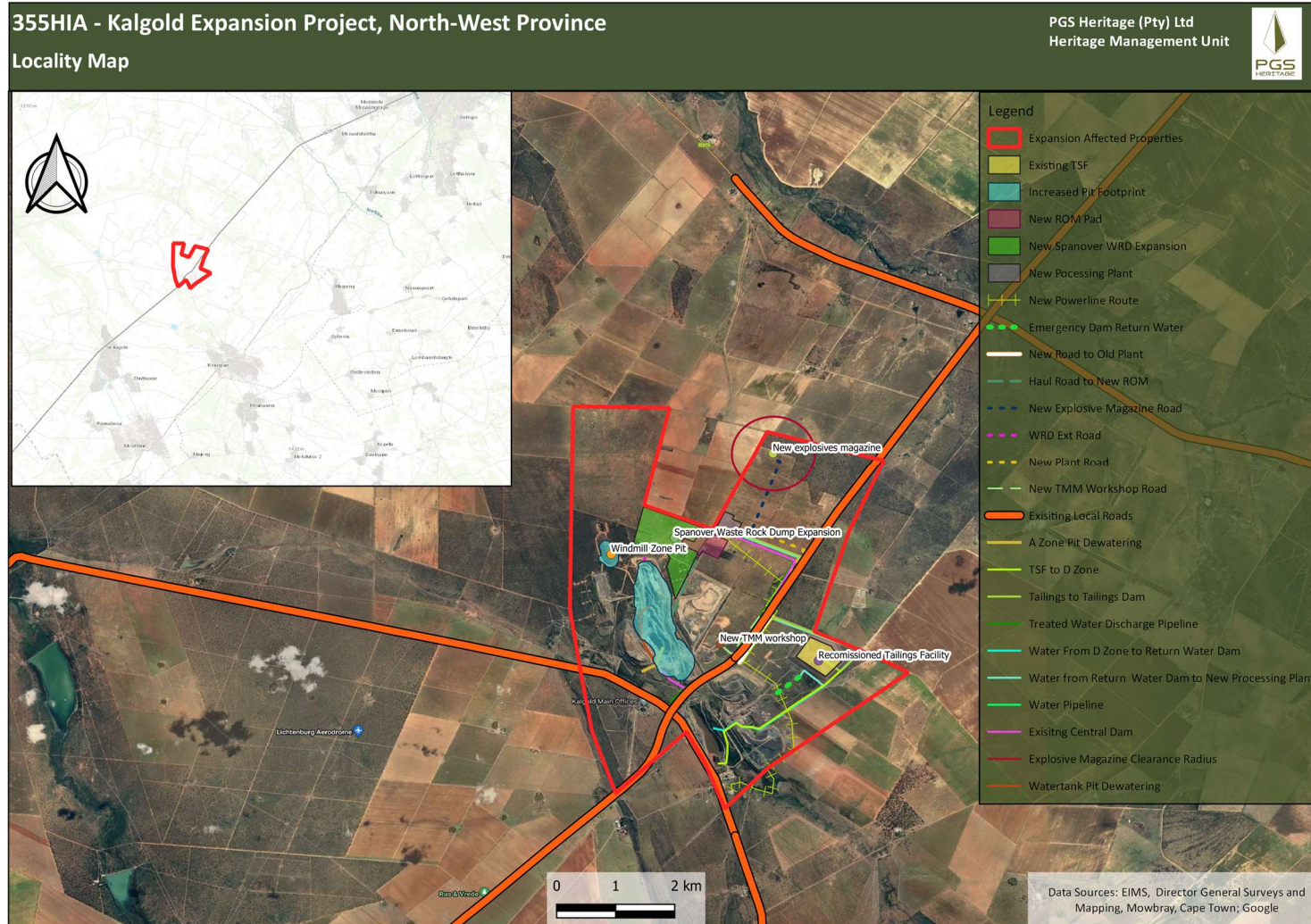


Figure 5 – Locality map of the Kalgold Mine (Harmony Gold)) illustrating the proposed development footprint (i.e. proposed infrastructure) within a regional context.



Figure 6 - N18 provincial road running through the proposed study area.



Figure 7 - Mine infrastructure and a large mine dump in the background.



Figure 8 - View of agricultural land.



Figure 9 - Land used for grazing cattle.



Figure 10 - View of powerlines on the farm Ferndale 554 IO.



Figure 11 - View of the powerlines running along the N18 provincial road

2.2 TECHNICAL PROJECT DESCRIPTION

The existing Harmony Kalgold operation wishes to expand its current production from the current production rate of 130 000 tons per month to 300 000 tons per month. A pre-feasibility study has been undertaken. The findings of the pre-feasibility study have concluded that the following new activities and expansions must be provided for (**Figure 12**):

- 1 The pit footprint will increase.
- 2 Larger dewatering pipelines.
- 3 Extension to Spanover waste rock dump.
- 4 Road from the pit to new ROM pad.
- 5 New ROM pad.
- 6 New plant.
- 7 Recommission old Tailings Storage Facility (TSF) at low deposition rate.
- 8 Increase tailings deposition rate at D-zone pit.
- 9 Install pipeline from Central dam to the new processing plant.
- 10 Install a tailings pipeline from the new processing plant to old TSF and D-zone pit (Pipelines for both deposition and also another for return water).
- 11 Install pipeline from old processing plant raw water pond to the new plant (D-zone return water)
- 12 Install two power lines from Ferndale substation to the new processing plant.
- 13 Install a water treatment plant at the new plant.
- 14 Relocate and expand the explosives magazine.
- 15 Additional new road from the plant to the N18.
- 16 New road from pit to ROM pad.
- 17 New road to Spanover waste rock dump extension.
- 18 Increase the size of the water pipe from Azone to Central dam.
- 19 Increase the size of the water pipe from Watertank pit to Central dam.

Kalgold mine is an open pit mining operation located some 60km South West of Mahikeng in the North West Province. The mine is owned and operated by Harmony Gold, who acquired the mine in 1999. The mine is located in the Kraaipan Greenstone Belt, which is part of the large Amalia-Kraaipan Greenstone terrain. The largest ore body is found in the D-Zone, which was mined out by a single pit operation along a strike length of 1 300m and to a depth of approximately 290m below surface. Mining at Kalgold Mine continued at the A-Zone, Windmill and Watertank Open Pits, which are all relatively new opencast operations.

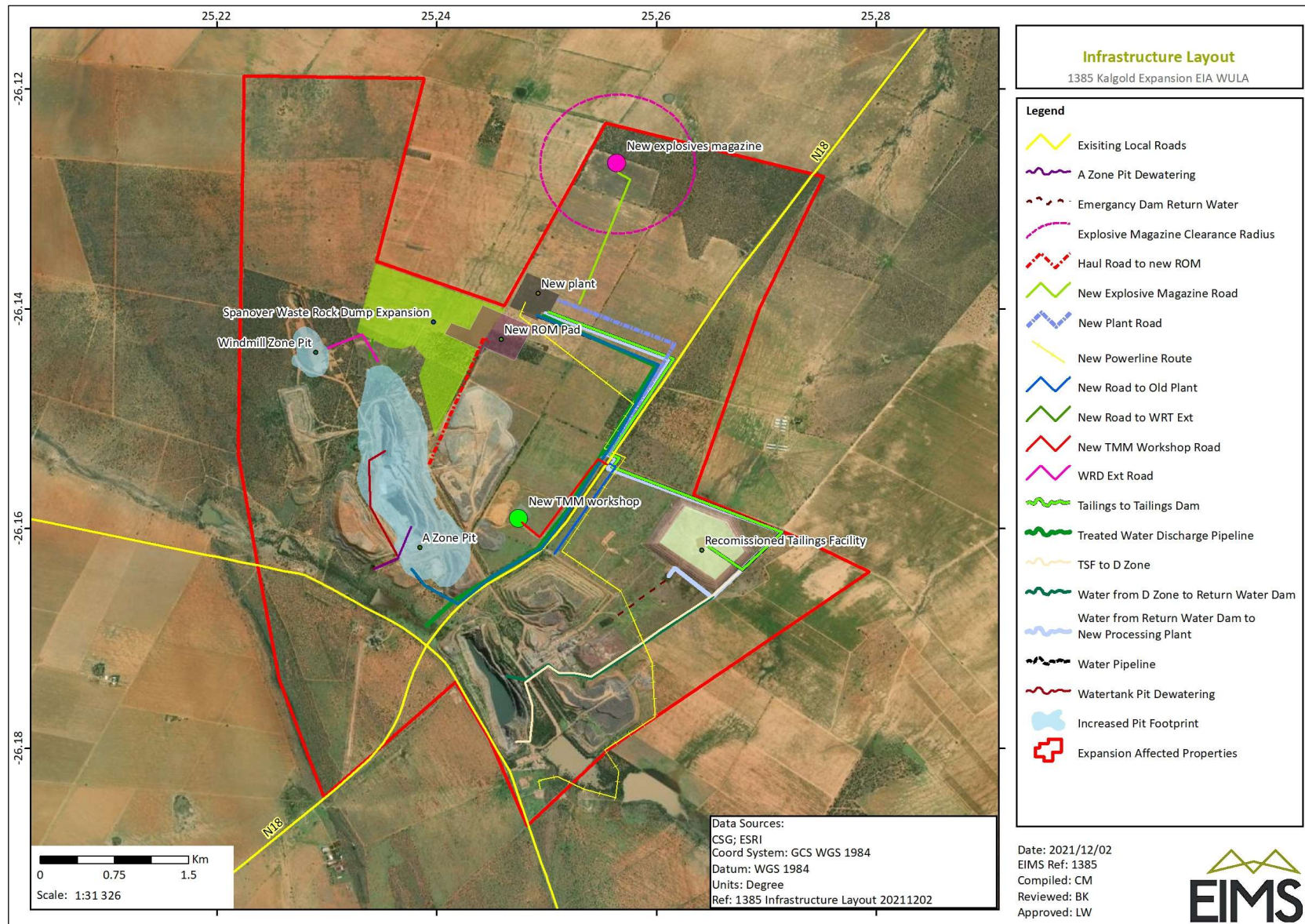


Figure 12 – Kalgold Mine Extension Project Development Plan (Provided by EIMS).

3 CURRENT STATUS QUO

3.1 SITE DESCRIPTION

The project area falls within the existing agricultural and mining areas between Mafikeng and Vryburg in the North-West Province. The study area is situated approximately 60km south-west from Mafikeng and a 100km north-east from Vryburg along the N18 provincial road. The N18 road runs all the way through the proposed study area. At its most northern point of the study area, the road runs through the top of the farm Spanover 552 IO running all along the farm boundary, with the farm Ferndale 554 IO located 10m to the east of the N18. Then the N18 crosses over into the farm Goldridge 642 IO running along until the most southern farm boundary and the extent of the study area.

The general area is mainly characterised by open flat fields with small clumps of trees in between in certain areas. In some areas the vegetation was very dense and visibility was low, it appears that these areas in particular were disturbed previously by agricultural activities.

Access was gained via the main entrance road running from the N18 into the Kalgold Mine. Visibility across the entire study area was fairly high due to the open fields around the mine.

Existing surrounding land uses associated with the project area include a combination of:

- mining related infrastructure and developments,
- farming and agricultural areas, and
- dirt roads.

As a result, the vast majority of the Kalgold Mine expansion project site footprint overlays slightly disturbed terrain. Overall, the accessibility of the project footprint area was fairly good. Although the site has been disturbed by previous agricultural activities, visibility was fair (**Figure 13 - Figure 16**).



Figure 13 - View of the farm Spanover 549 IO.



Figure 14 - View of the farm Spanover 552 IO with the mine dump in the background.



Figure 15 - View of the Farm Ferndale 554 IO with a mine dump in the background.



Figure 16 - View of the farm Goldridge 642 IO.

3.2 SITE VEGETATION

According to Mucina & Rutherford (2006) the Kalgold Mine (Harmony Gold) expansion project area is characterised by the following vegetation types; Klerksdorp Thornveld, Mafikeng Bushveld and Western Highveld Sandy Grassland. The vegetation types are briefly described below.

- Klerksdorp Thornveld: “Plains or slightly irregular undulating plains with open to dense *Acacia karroo* bush clumps in dry grassland.” (Mucina & Rutherford, 2006; Sanbi, 2021).
- Mafikeng Bushveld: “Well developed tree and shrub layers, dense stands of *Terminalia sericea*, *Acacia luederitzii* and *A. erioloba* in certain areas. Shrubs include *A. karroo*, *A. hebeclada* and *A. mellifera*, *Dichrostachys cinerea*, *Grewia flava*, *G. retinervis*, *Rhus tenuinervis* and *Ziziphus mucronata*. Grass layer is also well developed.” (Mucina & Rutherford, 2006; Sanbi, 2021).
- Western Highveld Sandy Grassland: “Flat to gently undulating plains with short, dry grassland, with some woody species occurring in bush clumps.” (Mucina & Rutherford, 2006; Sanbi, 2021).

4 ASSESSMENT METHODOLOGY

This HIA report was compiled by PGS for the proposed development of the Kalgold Mine Expansion Project. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the NEMA (no 107 of 1998). The HIA process consisted of three steps:

Step I –Desktop Study: A detailed archaeological and historical overview of the study area and surroundings were undertaken. This work was augmented by an assessment of reports and data contained on the South African Heritage Resources Information System (SAHRIS). Additionally, an assessment was made of the available historic topographic maps. All these desktop study components were undertaken to support the fieldwork.

Step II – Physical Survey: The fieldwork was conducted over several days from 11 to 13 October 2021. This fieldwork team consisted of two archaeologists Michelle Sachse and Nicholas Fletcher.

Step III – The final step involved the recording and documentation of relevant heritage resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

4.1 ARCHAEOLOGICAL SPECIFIC METHODOLOGY

Additional to the preceding methodological description the archaeological methodology included fulfilling the requirements of the NHRA (section 35 and 36) that protects the following features in the landscape:

- Material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- Rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- Graves and burial grounds, including ancestral graves, royal graves, graves of traditional leaders, graves of victims of conflict, historical graves and cemeteries, and other human remains not covered by the Human Tissue Act (1983) (Act No 65 of 1983).

5 HISTORICAL OVERVIEW OF THE STUDY AREA

5.1 OVERVIEW OF STUDY AREA AND SURROUNDING LANDSCAPE

DATE	DESCRIPTION
2.5 million to 250 000 years ago	<p>The Early Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammerstones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better-made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago (Korsman, & Meyer, 1999; Klein, 2000).</p> <p><i>No ESA sites are known from the vicinity of the study area.</i></p>
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA) dates to between 250 000 to 40 000 years BP. MSA dates of around 250 000 BP originate from sites such as Leopards Kopje in Zimbabwe while the late Pleistocene (125 000 BP) yields a number of important dated sites associated with modern humans (Deacon & Deacon, 1999). The MSA is characterised by flake and blade industries, the first use of grindstones, wood and bone artefacts, personal ornaments, use of red ochre, circular hearths and a hunting and gathering lifestyle.</p> <p><i>No MSA sites are known from the vicinity of the study area.</i></p>
40 000 years ago, to the historic past	<p>The Later Stone Age is the third phase identified in South Africa's archaeological history. It is associated with an abundance of very small stone artefacts known as microliths. In Southern Africa, the Later Stone Age is characterised by the appearance of rock art in the form of paintings and engravings (Wadley 2007).</p> <p>Thaba Sione is a famous rock art site situated approximately 30km southeast of the site. The area is well known for its 596 bushman rock engravings on 464 various dolerite rocks. These engravings were meant to represent the spirit world experiences of the bushmen (Ouzman 2007).</p> <p><i>No LSA sites are known from the vicinity of the study area.</i></p>
AD 450 – AD 750	<p>Two of the closest Early Iron Age sites can be found within the Magalies Area which is situated 250 km to the west of the site. Firstly, the Bambata ceramic facies was identified at the site known as Jubilee shelter in the Magaliesberg which dates to between AD150 - AD750 and is associated with the Kalundu tradition though no settlements were ever found relating to this facies within the region (Wadley 1996). Secondly the Mzonjani ceramic facies associated with the Urewe tradition which can be found at the site known as Broederstroom which is a settlement located in the Magalies Valley which dates to between AD450 – AD750 (Huffman 2007, Manson 1981, Wadley 1996).</p> <p><i>No EIA sites are known from the immediate vicinity of the footprint area.</i></p>
AD 1000 – AD 1300	<p>The Middle Iron Age in the surrounding area would most likely be represented by the Eiland ceramic facies which dates to between AD 1000 – AD 1300 and is associated with the Kalundu tradition (Evers 1988, Huffman 2007). Eiland ceramics can also be found on the settlements of communities in the Limpopo valley that produce Mapungubwe facies ceramics. This hints to regional trade occurring across the Soutpansberg mountain range at sites like Mapungubwe and Mutamba (Antonites 2012, Calabrese 2007: 24). Hall (1981) has also identified the Eiland facies at Rooikrans in the Boschoffsberg Valley and at Rhenosterkloof 3 in the Sand River Valley. While a variation of the Eiland facies can also be found in southeastern Botswana approximately a 150km north of the site and is known as the Broadhurst facies (Denbow 1981, Biemond 2017)</p>

DATE	DESCRIPTION
	<i>No MIA sites are known from the vicinity of the study area.</i>
AD 1650 – AD 1900	The late iron age in the region is represented by the Moloko ceramic facies which is representative of Sotho Tswana communities which moved into the region. These communities originally had quite a dispersed settlement pattern but later sometime in the 17 th century. This pattern changed as larger stone walled towns started to developed such as Molokwane in the Rustenburg district (Ramoroka 2009). One of these towns was Khunwanathe the Barolong capital. The Barolong communities occupied the areas in and surrounding Mafikeng until they were uprooted by the Difiquane and the invasion of Mzilikazis Ndebele in 1832 though some of the Borolong later returned to the area. (Mc clean 1986, Breutz 1959, Ramoroka 2009)

5.2 HISTORICAL BACKGROUND OF MAFIKENG AND VRYBURG

5.2.1 MAFIKENG

The first permanent European settlement was established in 1895 when land was leased from a local Tswana chief to establish a town called Mafeking. The main function of the town was to act as the administrative centre for the Bechuanaland protectorate (Parnell 1989). This was unusual as the British colonial administrative offices were located outside of the colony on crown land. In 1899/1900 a siege broke out between the British and Boer that lasted 292 days. The British used the Barolong as a shield against the Boer as they fought on their behalf (Ramoroka 2009). A result of this conflict is the boy scout movement. In 1913 the native land act was introduced and many of the local communities were forced into wage labour. In 1961 the decision was made to move the administrative centre back to Bechuanaland which had a negative effect on the town. To boost the local economy an air force training centre and army camp were established (Parnell 1989). In 1963 the South African government purchased the land known as the imperial reserve for the offices of the Tswana Tribal Authority. Under apartheid rule the decision was made to segregate the town, Danville became a coloured area while a new area called Montshiwa north of the town was established for black Africans (Parnell 1989). Since 1977, Mafikeng underwent economic growth with the construction of new buildings and housing. As the town grew, the original Tswana spelling had become favoured, and the town's name was changed from Mafeking to Mahikeng (Parnell 1989).

5.2.2 VRYBURG

During their travels through South Africa, Campbell, Bain, Biddulph, and Moffat had passed through Vryburg between 1820 and 1829 (Breutz 1959). Through their various missions, small scale written and drawn records were made of the town prior to its establishment. The town of Vryburg was established in 1883 as the capital of the Republic of Stellaland, with citizens referring to themselves as Vryburgers or free citizens (van Schalkwyk 2021) and in 1896 the town achieved municipal status. During the Anglo Boer War (1899-1902) a concentration camp was set up just outside of Vryburg.

Vryburg is the Main Railway Line which connects Cape Town, and Botswana This feature tends to attract many tourists to Vryburg. The town of Vryburg has five buildings as well as cemeteries and monuments which are listed as holding provincial importance (van Schalkwyk 2021).

5.3 ARCHIVAL/HISTORICAL MAPS

The examination of historical data and cartographic resources represents a critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Relevant topographic maps and satellite imagery were studied to identify structures, possible burial grounds or archaeological sites present in the footprint area.

Topographic maps (1:50 000) for various years (1972 and 2001) were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The maps were also used to assess the possible age of structures located, to determine whether they could be considered as heritage sites. Map overlays were created showing the possible heritage sites identified within the areas of concern, as can be seen below (**Figure 17**).

The relevant topographical maps include:

- First Edition 2625AA West End Topographic Sheet. Published by the Chief Director of Surveys and Mapping in 1972, and printed by the Government Printer.
- First Edition 2625AB Mareetsane Topographic Sheet. Published by the Chief Director of Surveys and Mapping in 1972, and printed by the Government Printer.
- Second Edition 2625AA West End Topographic Sheet. Published by the Chief Director of Surveys and Mapping in 2001, and printed by the Government Printer.
- Second Edition 2625AB Bathobatho Topographic Sheet. Published by the Chief Director of Surveys and Mapping in 2001, and printed by the Government Printer.

It can be seen on the 1972 map sheets consulted the entire project area is mostly covered in cultivated land as well as bushes and trees with some roads in-between, including the provincial road the N18, and a few structures. On the 2001 map sheets it is apparent that mining activities took place. The Kalgold mine can be seen with its associative excavations and mine dumps. There are roads and more structure are evident on these later topographical maps. The area surrounding the mine is still characterised by cultivated lands in some areas.

Furthermore, from the Chief Surveyor General database (<http://csg.dla.gov.za/>) the farms Spanover, Spanover, Ferndale and Goldridge were surveyed (**Figure 18 - Figure 20**).

Farm Spanover 549 IO - On April 1921 by H. P Ashtou.

Farm Spanover 552 IO - On April 1982 by J. C. Pieterse.

Farm Goldridge 642 IO - On December 2003 by J. C. Pieterse.

There are no SG maps available for the farm Ferndale 554 IO.

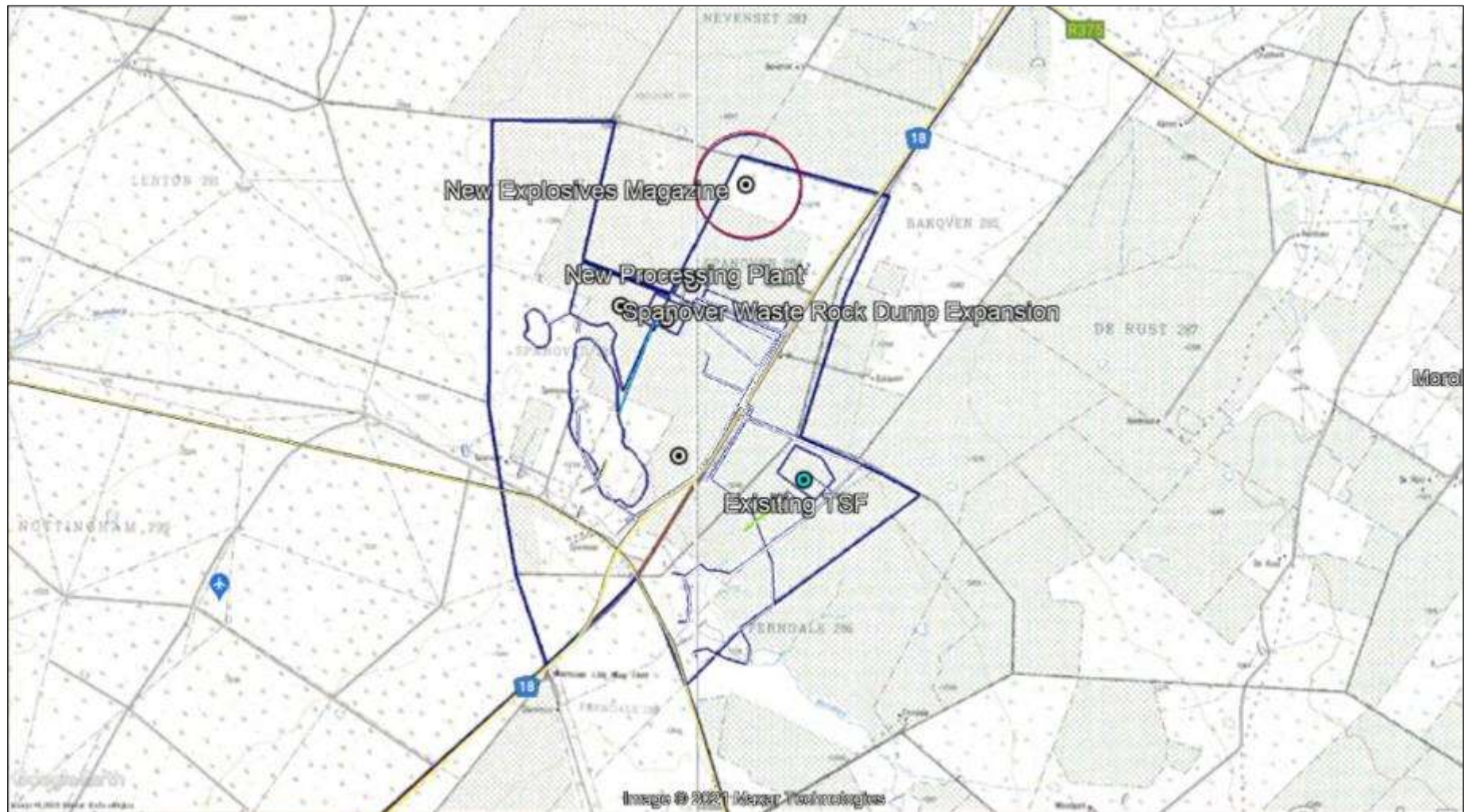


Figure 17 – First Edition Topographic maps (1:50 000) 2526AA West End (1972) and 2526AB Mareetsane (1972) showing the Kalgold Expansion Project (marked in blue).

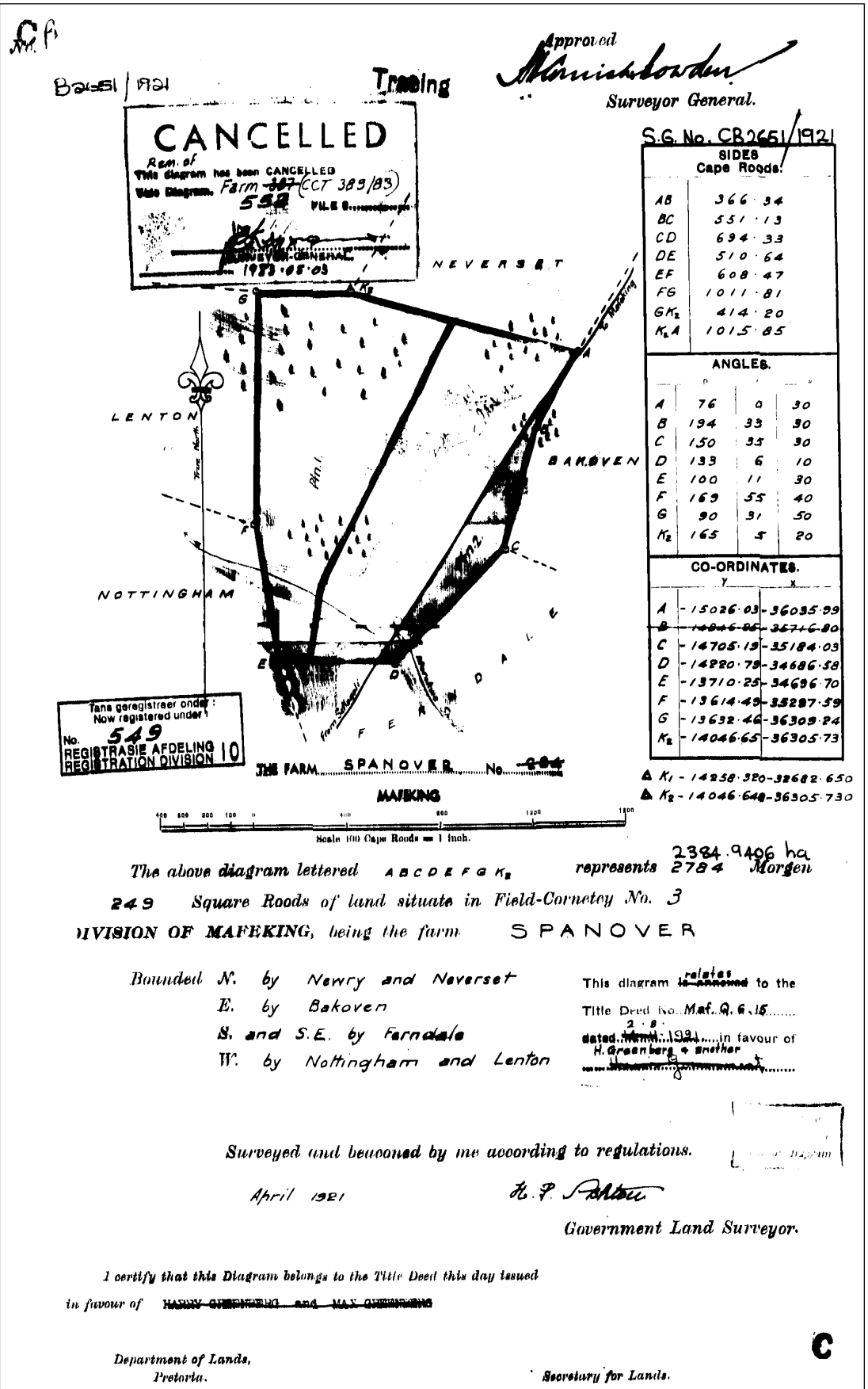


Figure 18 - SG-Diagram from the Chief Surveyor-General database for Farm Spanover 549 IO surveyed by the Land surveyor H. P Ashtou in 1921.

SAAIMAN & PIETERSE, Landmeters, VRYBURG C 3393/82				
SYE meter	HOEKE	KÖÖRDINATE (Voorlopig)		
		Y (Lo. 25°)	X	
	Konstante	0,00		+ 2 000 000,00
AB	2 049,93	A 101 25 10	A -	
BC	6 083,51	B 72 15 44	B -	
CD	50,66	C 122 00 26	C -	
DE	148,02	D 233 16 03	D - 24 193,81	+ 895 841,23
EF	159,28	E 176 53 26	E - 24 103,21	+ 895 958,28
FG	151,57	F 177 04 19	F - 23 999,03	+ 896 078,76
GH	1 203,23	G 176 03 02	G - 23 894,16	+ 896 188,20
HJ	1 251,87	H 66 37 20	H - 23 003,82	+ 896 997,56
JK	584,88	J 70 05 50	J - 22 598,43	+ 895 813,15
KL	1 243,08	K 2682 13 40	K -	
LA	4 917,98	L 162 05 22	L -	
CH	283,18	DCH 180 00 00	H - 24 527,60	+ 895 847,10
HN	142,46	JHN 180 00 00	H - 23 049,95	+ 897 132,34
	94 Goldridge	Δ	- 24 686,91	+ 903 418,42
	101 Neverset	Δ	- 23 853,11	+ 889 728,88
Bakenbeskrywing:-				
A,C,K,L.....: 12 mm. ysterpen in klipstapel.				
B.....: Ingeplante klip wat 380 mm. uitsteek.				
D,E,F,G,H.....: 1,0 m. ysterpaal in klipstapel.				
J,N.....: Ysterpaal in klipstapel.				
Die figuur A B C D E F G H J K L stel voor 1 085,149 ² hektaar grond, synde die plaas SPANOVER 552-10				
en bestaan uit:-				
1. Die figuur A B C K L synde RESTANT van die plaas SPANOVER 284: 549 Kaart 2651/1921. Grondbrief Maf. Q.6-15, ged. 2-8-1921 t.g.v. Harry Greenberg en Max Greenberg.				
2. Die figuur J D E F G H synde GEDEELTE 10 van die plaas FERDALE 286: 551 Kaart 3390/82 Transport. 388/1983 gedateer t.g.v.				
geleë in die Administratiewe Distrik MAFEKING.				
Provinsie KAAP DIE GOEIE HOOP.				
Saamgestel in April 1982				
deur my J.C. PIETERSE Landmeter.				
Hierdie kaart is gehêg aan Sert. van Veren. Titel T.389/1983 Registrateur van Aktes	Die oorspronklike kaarte is soos hierbo aangehaal.	Lêr Nr. Mfg 387	Meetstukke Saamgestel	Kompilasië, J.C. Pieterse (1982) Bakens J,M,N en grense JM en JN bevestig.

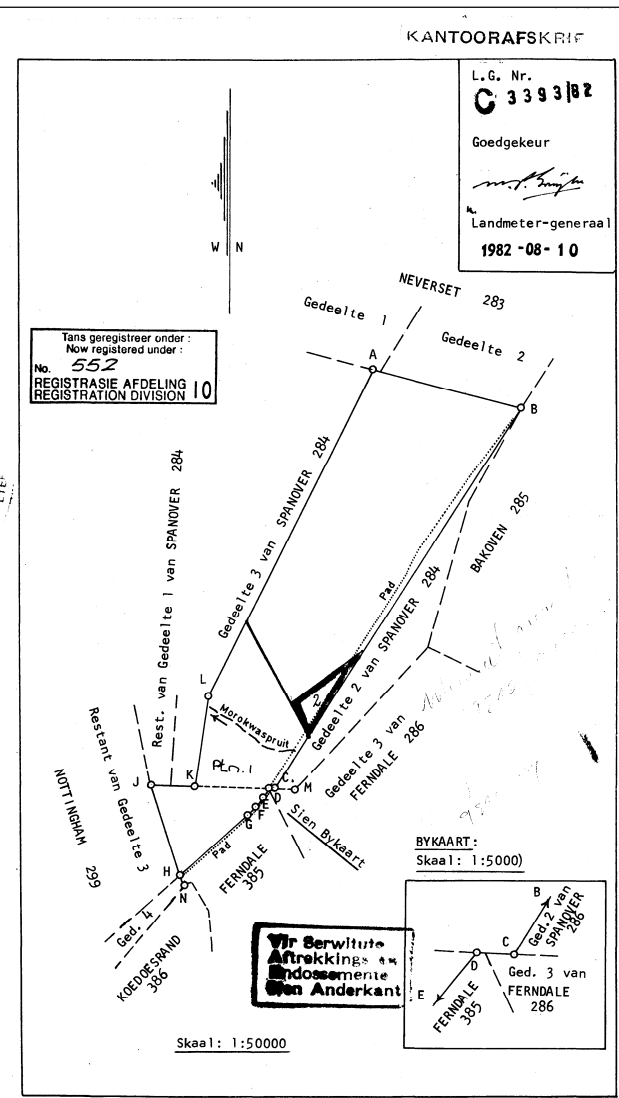

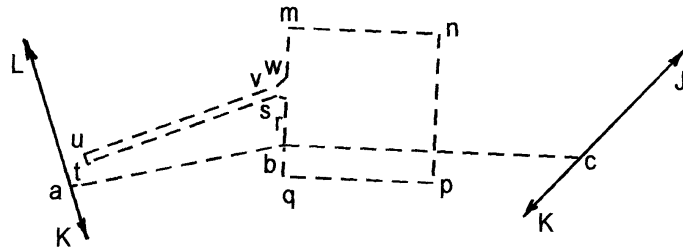


Figure 19 - SG-Diagram from the Chief Surveyor-General database for Farm Spanover 552 IO surveyed by the Land surveyor J. C. Pieterse in 1982.

GOLDRIDGE No. 642-1 642 - IO	S.G. No. 11821/2003
INSET: SCALE 1:4000	Approved 
	for J.S. WEYERS Surveyor-General 2004-02-03
	Sheet 2 of 2 Sheets

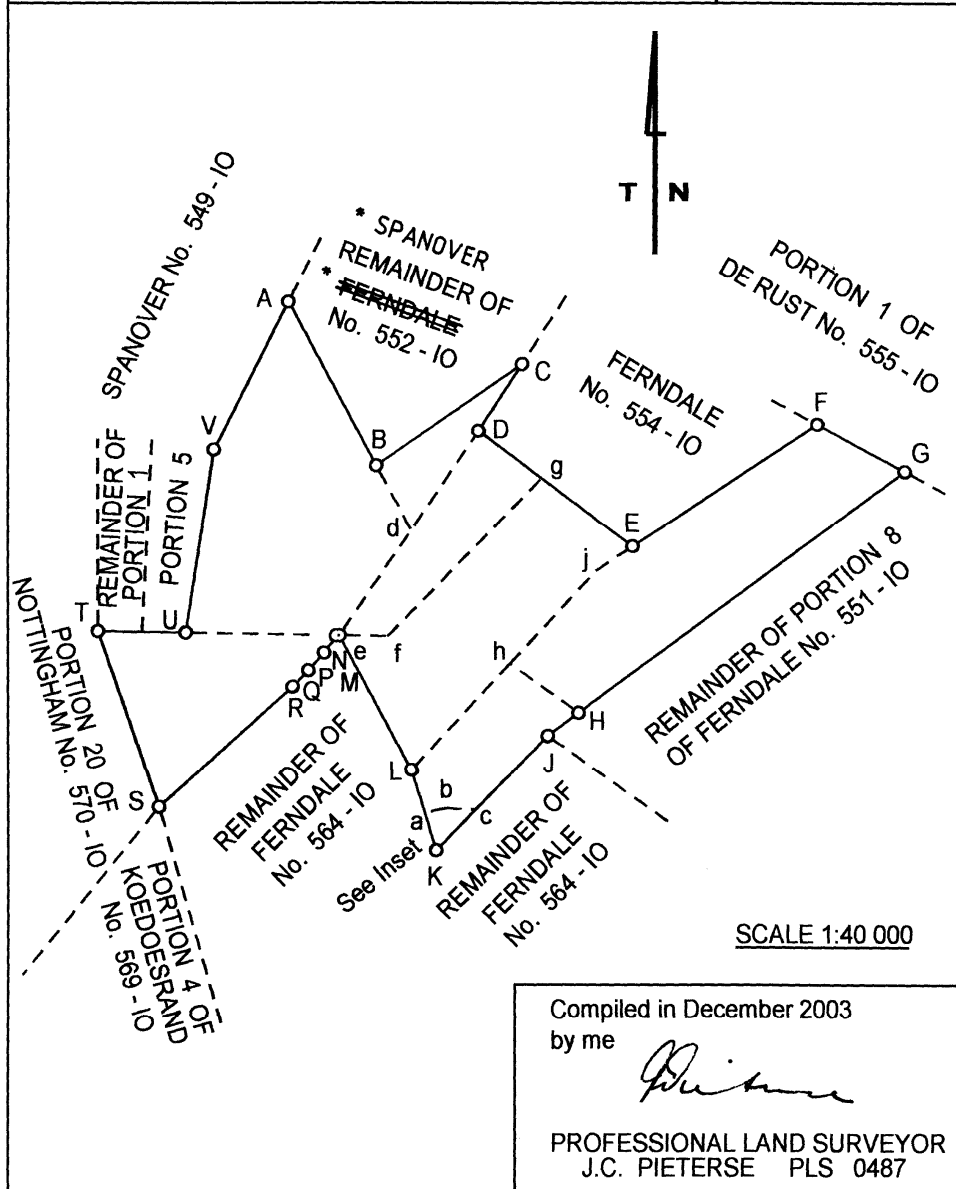


Figure 20 - SG-Diagram from the Chief Surveyor-General database for Farm Goldridge 642 IO surveyed by the Land surveyor J. C. Pieterse in 2003.

5.4 PREVIOUS ARCHAEOLOGICAL AND HERITAGE STUDIES IN AND AROUND THE STUDY AREA

All previous studies that were located on the SAHRIS system and/or received from the client, will be briefly discussed in chronological order below. In each case, the results of each study are shown in bold.

- Van Schalkwyk, J. 2004. Heritage Impact Assessment of a section of the Kraaipan Secondary Road, Vryburg and Ditsobotla Districts, North West Province. **The report identified various memorials and cemeteries associated with the South African War (1899-1902). Most of these were in the vicinity of Kraaipan some 16km to the east of the study area.**
- Sellane, M. 2013. Heritage Impact Assessment for the proposed Mareetsane Batho-Batho Solar photo voltaic (PV) Facility and associated powerline. **The report identified 10 burial grounds in an are some 30km to the east of the study area.**
- Küsel, U.S. 2013. Cultural Heritage Resources Impact Assessment for a proposed extension of operations on portions of the farm Spanover 552 IO at the existing mine "KALGOLD" in the North-West province for "Harmony Kalgold Mining Operations", As well as updating of the heritage remains on the existing mine. African Heritage Consultants. **Various heritage features were identified including four cemeteries, various ruins and farmstead most dating from the 1960s.**

5.5 FINDINGS OF HISTORICAL DESKTOP STUDY

The findings can be compiled as follows and have been combined to produce a heritage sensitivity map for the project based on the desktop assessment (**Figure 21**).

5.5.1 HERITAGE SENSITIVITY

The sensitivity maps were produced by overlying:

- Satellite Imagery;
- Current Topographical Maps; and
- First and second edition Topographical Maps dating from 1972 to 2001.

This enabled the identification of possible heritage sensitive areas that included:

- Archaeological Sensitive areas; and
- Structures/Buildings.

By superimposition and analysis, it was possible to rate these structure/areas according to age and thus their level of protection under the NHRA. Note that these structures refer to possible tangible heritage sites as listed in **Table 4**.

Table 4 -Tangible heritage sites in the study area

Name	Description	Legislative protection
Archaeology - Iron Age Sites	Older than 100 years	NHRA Sect 3 and 35
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34
Graves and Burial Grounds	60 years or older	NHRA Sect 3 and 36

Additionally, evaluation of satellite imagery has indicated the following areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 5**.

Table 5 - Landform type to heritage find matrix

LANDFORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Watering holes/pans/rivers	LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements
Forested areas	LIA sites

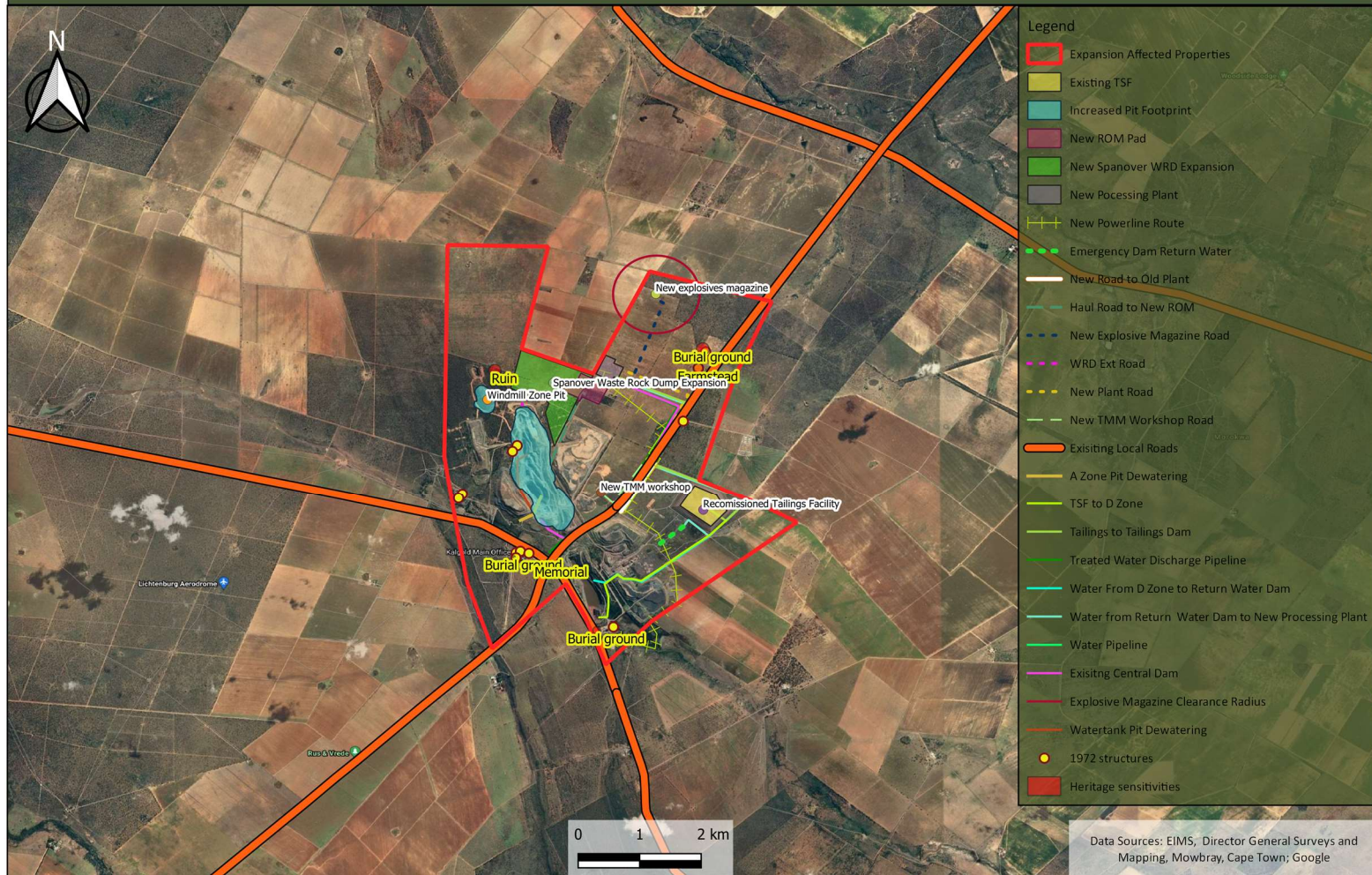


Figure 21 - Known heritage feature located in and around the Kalgold Expansion Project area.

6 FIELDWORK AND FINDINGS

A controlled surface survey was conducted on foot and by vehicle by two archaeologists from PGS , Michelle Sachse and Nicholas Fletcher. The fieldwork component was done by means of a walkthrough of the study and was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted over several days from 11 to 13 October 2021. The tracklogs (in yellow) for the survey are indicated in **Figure 22**.

During the survey, no heritage sites were identified. This includes historical structures and burial ground and graves.

6.1 SENSITIVITY ASSESSMENT OUTCOME

From the desktop assessment no high to low heritage sensitive areas were identified.

No heritage sites were identified during the survey of the project area.



Figure 22 – Fieldwork tracklogs (yellow).

7 PALAEOLOGY

According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the area is moderate to low sensitive. No paleontological studies are required however a protocol for finds is required (for the small areas marked in blue) and a desktop study is required (for the areas marked in green) (**Figure 23**). This study will be submitted as a separate report.

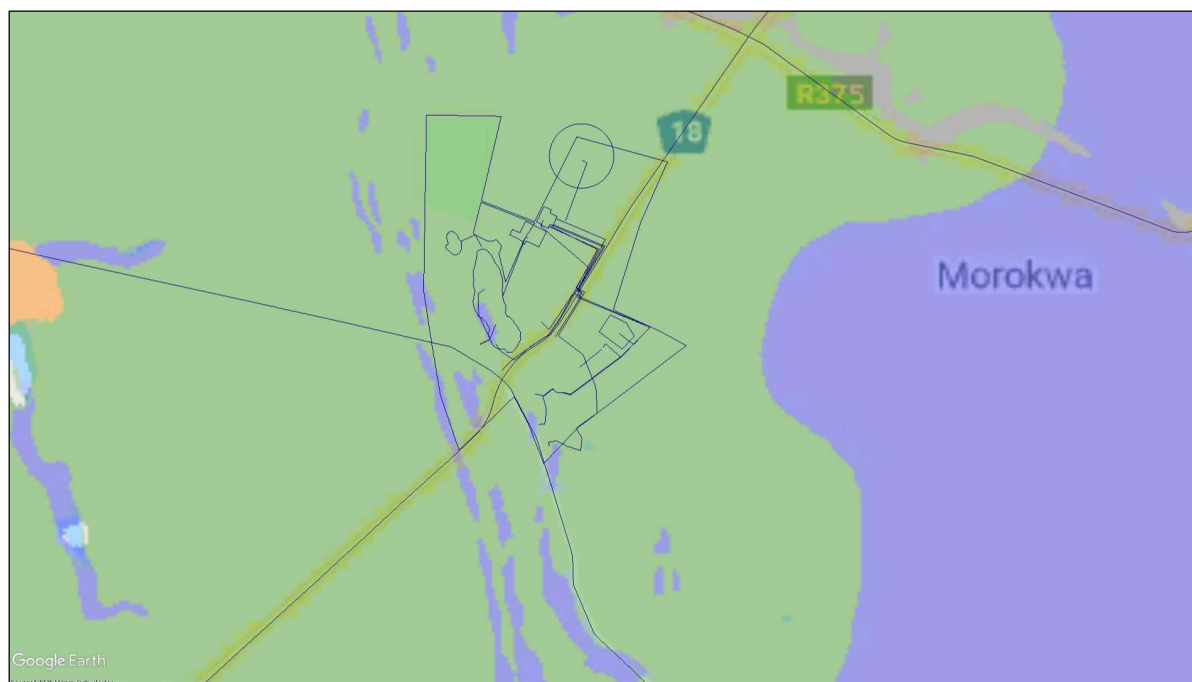


Figure 23 – Palaeontological Heritage Sensitivity map. As can be viewed, most of the area is moderate to low sensitive (Retrieved from SAHRIS).

Table 6 - SAHRIS palaeosensitivity ratings table.

Colour	Sensitivity	Required Action
Red	Very High	field assessment and protocol for finds is required
Orange/Yellow	High	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
Green	Moderate	Desktop study is required
Blue	Low	No palaeontological studies are required however a protocol for finds is required
Grey	Insignificant/Zero	No palaeontological studies are required
White/Clear	Unknown	These areas will require a minimum of a desktop study. As more information comes

8 IMPACT ASSESSMENT

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for the impacts identified.

8.1 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. The consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology, the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R) \times N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 7** below.

Table 7 - Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),

Aspect	Score	Definition
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Error! Reference source not found.9.

Table 8 - Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur)

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

Table 9 - Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
	0	1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 10**.

Table 10 - Significance Classes

Environmental Risk Score	
Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk).
≥9 - <17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post-implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

8.2 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 11 - Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.

Irreplaceable Loss of Resources (LR)	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$\text{Priority} = \text{CI} + \text{LR}$$

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 12**).

Table 12 - Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
2	Low	1
3	Medium	1.125
4	Medium	1.25
5	Medium	1.375
6	High	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post-mitigation scoring. The ultimate aim of the PF is an attempt to increase the post-mitigation environmental risk rating by a full ranking class if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be too upscale the impact to a high significance).

Table 13 - Final Environmental Significance Rating

Environmental Significance Rating	
Value	Description
< -17	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
≥ -17 ≤ -9	Medium negative (i.e. where the impact could influence the decision to develop in the area).
> -9, <0	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
<0, <9	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).

$\geq 19 \leq 17$	Medium positive (i.e. where the impact could influence the decision to develop in the area).
≥ 217	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

8.3 HERITAGE IMPACTS

No heritage resources were identified.

Despite an intensive walkthrough of the footprint area, no evidence for any archaeological or heritage sites could be identified. As a result, no impact is expected from the proposed development on heritage.

Table 14 indicates the rating of the possible impacts and the overall impact inclusive of cumulative impact is low. The possibility of chance finds of unidentified heritage resources, can be mitigated through the proposed management measures contained in the next section so this report.

Table 14 - Impact rating for heritage resources

IMPACT DESCRIPTION		Pre-Mitigation							Post Mitigation							Priority Factor Criteria				
Identifier	Impact	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
10.1.1	Impact on heritage resources	-1	1	2	1	3	2	-3.5	-1	1	2	1	2	1	-1.5	High	1	1	1.00	-1.5
10.1.2	Impact on palaeontology	-1	1	2	1	3	2	-3.5	-1	1	2	1	2	1	-1.5	High	1	1	1.00	-1.5

8.4 HERITAGE IMPACTS

No sites were identified.

Despite an intensive walkthrough of the footprint area, no evidence for any archaeological or heritage sites could be identified. As a result, no impact is expected from the proposed development on heritage.

8.5 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

8.5.1 CONSTRUCTION PHASE

The project will encompass a range of activities during the construction phase, including ground clearance, the establishment of construction camp areas and small-scale infrastructure development associated with the project. It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, however, foundation holes do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure developments, such as construction camps and laydown areas, are often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for. During the construction phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

8.5.2 GRAVE MANAGEMENT PLAN GUIDELINES

- The HIA identified several burial Grounds and Graves (BGG). These will require management and mitigation if any of the resources will be affected by any construction-related activities. The following should be included in the Management Plan to be drafted for the BGG to be retained *in situ* in the project area:
 - Direct what needs to be done, how the identified and accidentally discovered BGG must be protected and managed, and who will be responsible;
 - Define the goals to be achieved and the type of activities;
 - Guide any future construction or development-related activities;
 - Determine the monitoring methodology;
 - Assist with stakeholder engagement and identification of interested parties, if needed;
 - Explain the permitting procedure;
 - Describe any professional requirements and clarify responsibilities;
 - Identify the significance of the heritage resources and provide guiding principles for activities on site;
 - Identify the site value and provide guiding principles for activities on-site;

- Minimise loss or avoid adverse impacts on heritage resources;
- Ensure that cultural heritage is incorporated in spatial planning and linked to social strategies;
- Improve the understanding of cultural heritage and the contribution it makes to the broader management processes; and
- Ensure that proper investigation, recording and stakeholder meetings take place.

Includes the Chance Finds Procedure, which outlines the process to follow if any culturally significant heritage resources are found during construction/or operation related activities

8.5.3 CHANCE FIND PROCEDURE

- An appropriately qualified heritage practitioner/archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted.
- The qualified heritage practitioner/archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner/archaeologist.

8.5.4 POSSIBLE FINDS DURING CONSTRUCTION AND OPERATION

The study area occurs within a greater historical and archaeological site as identified during the desktop and fieldwork phase. Soil clearance for infrastructure as well as the proposed reclamation activities could uncover the following:

- stone foundations;
- ash middens associated with the historical structures that can contain bone, glass and clay ceramics, ash, metal objects such as spoons, forks, and knives.
- unmarked graves

8.6 TIMEFRAMES

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. **Table 15** gives guidelines for lead times on permitting.

Table 15 - Lead times for permitting and mobilisation

Action	Responsibility	Timeframe
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Preparation for field monitoring and finalisation of contracts	The contractor and service provider	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	3 months
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government	6 months

9 CONCLUSIONS

PGS was appointed by Environmental Impact Management Services (Pty) Ltd to undertake a HIA which will serve to inform the EIA and EMP for the proposed KEP for Harmony Gold, in the Ratlou Local Municipality within the Ngaka Modiri Molema District Municipality, between Mafikeng and Vryburg, North West Province.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed development footprint of the KEP of Harmony Gold. Immediate and direct impacts on archaeological and palaeontological resources were addressed through the HIA.

The HIA has shown that the study area and surrounding area has no heritage resources situated within the proposed development boundaries.

9.1 HERITAGE SITES

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the study area. The fieldwork was conducted over several days from 11 to 13 October 2021. This fieldwork team consisted of two archaeologists, Michelle Sachse and Nicholas Fletcher. During the survey, no heritage sites were identified.

9.2 IMPACT STATEMENT

Despite an intensive walkthrough of the project area, no evidence for any archaeological or heritage sites could be identified. As a result, no impact is expected from the proposed development on heritage.

9.3 MITIGATION MEASURE

With no impact expected on heritage, no further mitigation is required. Refer Chapter 8 of this report.

9.4 GENERAL

It is the author's considered opinion that the overall impact on heritage resources is Low. Provided that the recommended mitigation measures are implemented, the impact would be acceptably Low or could be totally mitigated to the degree that the project could be approved from a heritage perspective.

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WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave "rescue" excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
 - Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
 - Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

- Principal Investigator - Grave Relocations
- Field Director – Iron Age
- Field Supervisor – Colonial Period and Stone Age
- Accredited with Amafa KZN

Key Work Experience

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique, Malawi, Mauritius, Zimbabwe and the Democratic Republic of the Congo

PROFESSIONAL CURRICULUM FOR MICHELLE SACHSE
Archaeologist for PGS Heritage

Summary of Experience

Involvement in various grave relocation projects in the various provinces of South Africa.

Expertise in Heritage Impact Assessment Surveys, Historical and Archival Research, Archaeology, Fieldwork including *inter alia* -

Involvement with various Heritage Impact Assessments,

- Heritage Impact Assessments within Gauteng, Limpopo, Mpumalanga, North-West and the Northern Cape Province.
- Archaeological Walkdowns for various projects.
- Desktop, archival and heritage screening for projects.

Key Qualifications

2016 - 2019	MA in Archaeology University of Pretoria, Pretoria
2015	BA Honours in Archaeology University of Pretoria, South Africa
2012 - 2014	BA (General) University of Pretoria, South Africa Major subjects: Archaeology and History

Key Work Experience

- 2020 – to date: Archaeologist - PGS Heritage
- 2018 – 2019: Assistant Manager at the Archaeology Laboratory on South Campus at the University of Pretoria

PROFESSIONAL CURRICULUM FOR NICHOLAS FLETCHER
Archaeologist for PGS Heritage

Summary of Experience

Expertise in Heritage Impact Assessment Surveys, Historical and Archival Research, Archaeology, Fieldwork including *inter alia* -

Involvement with various Heritage Impact Assessments,

- Heritage Impact Assessments within Gauteng, Limpopo, Mpumalanga, North-West and the Northern Cape Province.
- Archaeological Walkdowns for various projects.
- Desktop, archival and heritage screening for projects.

Key Qualifications

2021	Submitted a MA in Archaeology University of Pretoria, Pretoria
2015	BA Honours in Archaeology University of Pretoria, South Africa
2014	BA (General) University of Pretoria, South Africa Major subjects: Archaeology and History

Key Work Experience

- 2021: Archaeologist - PGS Heritage
- 2018 – 2019: Lab Technician for the Archaeology Laboratory at the University of Pretoria