aurecon

Report: Environmental Impact Assessment Process: 200 Megawatt Photovoltaic Energy Facility Proposed for Sibanye Gold, West Witwatersrand, Gauteng

HERITAGE IMPACT ASSESSMENT

Reference: 111943

Revision: 0

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

200 Megawatt Photovoltaic Energy Facility Proposed for Sibanye Gold, West Witwatersrand, Gauteng

Specialist:	PGS Heritage (Pty) Ltd		
Contact person:	Wouter Fourie		
Postal address:	PO Box 32542, Totiusdal, Tshwane		
Postal code:	0134	Cell:	0828513575
Telephone:	0123325305	Fax:	
E-mail:	wouter@pgsheritage.co.za		
Professional affiliation(s) (if any)	ASAPA, AHAP		

Project Consultant:	Aurecon South Africa (Pty) Ltd		
Contact person:	Reuben Heydenrych		
Postal address:	Aurecon Centre, Lynnwood Bridge Office Park, Tshwane		
Postal code:	0081	Cell:	0834500628
Telephone:	0124272136	Fax:	
E-mail:	Reuben.Heydenrych@aurecongroup.com		

4.2 The specialist appointed in terms of the Regulations_

I, Wouter Fourie , declare that --

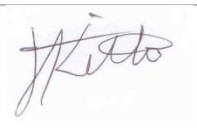
General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, 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 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;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

PGS Heritage
Name of company (if applicable):

15 February 2016
Date:

Report Title	Heritage Impact Assessment as part of the Environmental Impact Assessment Report for the New 200MW Photovoltaic Energy Facility Proposed For Sibanye Gold, Gauteng		
Control	**Name**	**Signature**	**Designation**
Authors	Jennifer Kitto		Heritage Specialist / PGS Heritage
	Wouter Fourie		Project Sponsor / PGS Heritage
	Dr Gideon Groenewald		Palaeontologist
Reviewed	Reuben Heydenrych		Client / Aurecon South Africa (Pty) Ltd

CONTENTS **PAGE**

LIST OF APPENDICES

LIST OF FIGURES

LIST OF ACRONYMS AND GLOSSARY

Table 1 - List of Acronyms

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
BP	Before Present
CMPr	Conservation Management Programme
CRM	Cultural Resource Management
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
MW	MegaWatt (1,000,000 Watts)
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage (Pty) Ltd
PIA	Palaeontological Impact Assessment
PHRA	Provincial Heritage Resources Authority
PV	Photovoltaic
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

Glossary

Archaeological resources

i. 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;

ii. 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 a 10m buffer area;

iii. 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;

iv. 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, technological value or significance.

Development

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

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

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

Later Stone Age

The archaeology of the last 20 000 years, associated with fully modern people (Figure 1)

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's associated with ironworking and farming activities such as herding and agriculture (Figure 1).

Middle Stone Age

The archaeology of the Stone Age, dating to between 20 000-300 000 years ago, associated with early modern humans (Figure 1).

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past and any site which contains such fossilised remains or trace.

Figure 1 - Human and Cultural Time line in Africa (Morris, 2008)

1 EXECUTIVE SUMMARY

PGS Heritage was appointed by Aurecon South Africa (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), which forms part of the Scoping Report (SR) for the proposed 200 MegaWatt (MW) Photovoltaic Energy Facility proposed For Sibanye Gold in Westonaria Local Municipality, Gauteng. Initially, three alternative sites for the PV facility were selected (Site 1, Site 2 and Site 3) and assessed at a screening level; subsequent to this, a site selection process undertaken by Aurecon determined that the Site 1 and Site 2 alternatives were preferred over Site 3. The detailed field survey and assessment therefore focused on Site 1 and the portion of Site 2 located immediately adjacent to Site 1.

An archival-historical and a palaeontological desktop study were undertaken for the study area, the results of which were used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history.

The desktop study work was followed by fieldwork, which comprised a field survey of the study area, undertaken separately by an archaeologist and assistant and by a palaeontologist. Each of the two preferred site alternatives (Site 1 and Site 2) and three transmission line corridor options (Option 1, Option 2 and Option 3) were visited and inspected by vehicle and on foot. Since the two preferred site alternatives are located on land that is mostly utilised for maize fields (and which were ploughed at the time of the fieldwork), the ground visibility was very good. The transmission line route options traverse ground that comprises a combination of agricultural fields, grasslands and residential and mining areas. Therefore, the ground visibility for these sections of the survey was not as clear as for the surveys of the PV facility alternative sites.

Limitations to study and gaps in knowledge

As noted above and in the body of the report, three initial alternative sites for the PV facility were selected (Site 1, Site 2 and Site 3). At the onset of the process, a one day site visit and Multi-Criteria Site Selection Workshop was undertaken by Aurecon South Africa (Pty) Ltd (the environmental consultant) with the relevant specialists, on 5 and 6 August 2015, to collect information at a screening level and objectively determine the preferred site for the proposed PV facility. The aim of the site visit was to determine the status quo and identify any sensitive features or natural resources at the three site alternatives that could be negatively affected by the proposal. The Multi-Criteria Site Selection Workshop was a forum for discussion amongst the project team, where specialist and professional input was given with regard to various criteria and site visit observations, which could affect the selection of the preferred site alternative.

Subsequently, Aurecon documented the results of the site selection process, based on the site visits and workshop, resulting in a clear preference for alternative Site 1, followed by alternative Site 2. Based

on an integrated analysis of technical, biophysical and socio-economic criteria, it was recommended that both Site 1 and Site 2 be assessed in the EIA scoping study. Therefore, the detailed assessment work undertaken for this HIA study is focused on Site 1 and Site 2, as well as the three options for transmission line corridors. The alternative Site 3 was assessed at a screening level.

The predicted impacts of the proposed projects are summarised in the table on the next page.

Summary of the predicted impacts

The archival cartographic study indicated the presence of several historic structure sites within the immediate study area. The palaeontological desktop study also indicated the potential for fossiliferous material in the underlying geology of the immediate and surrounding study area.

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Conse-quence	Probability	Signifi-cance		Duration	Extent	Intensity	Conse-quence	Probability	Signifi-cance
Destruction of fossils	Permanent	Local	Very High - negative	Highly detrimental	Highly Probable	Moderate - negative	In areas where excavation for foundations will exceed 1.5m, or if sinkholes, cave breccia or significant stromatolites are found, the palaeontologist must be informed. Any presence of bone material must be reported as soon as it is discovered and the site must be closed for further excavation until such time that the palaeontologist has an opportunity to investigate the remains and declare the site safe for further excavation	Permanent	Local	Moderate - positive	Highly beneficial	Probable	Minor - positive
Destruction of possible graves	Immediate	Very limited	Negligible	Negligible	Highly unlikely	0	Prior to construction, the two possible graves (SB6) should be tested to see whether they are graves or not. If they are then they will require in situ preservation and avoidance as per SAHRA requirements. A buffer of 20 m is suggested if avoidance and protection occurs.	Immediate	Very limited	Very low - positive	Negligible	Highly unlikely	Negligible - positive
Destruction of historic structures	Immediate	Very limited	Negligible	Negligible	Highly unlikely	0	If they cannot be avoided with at least a 20 m buffer, the significant historical structures identified (SB3-SB8) must be mitigated well in advance of construction.	Immediate	Very limited	Very low - positive	Negligible	Highly unlikely	Negligible - positive
Destruction of recent structures	Immediate	Very limited	Negligible	Negligible	Highly unlikely	0	No mitigation is required in terms of the heritage legislation.	Immediate	Very limited	Negligible	Negligible	Improbable	0

Identification of main impacts; indicating significance and acceptability of impact after mitigation

Historical-archaeological resources

The fieldwork confirmed the existence of some of the sites noted from the desktop historical study and identified several other sites. In total, nine sites of varying levels of heritage significance were identified. Three of the sites are of recent historic date and have a negligible-neutral heritage significance (**SB1, SB2, SB9**). Sites **SB3-SB8** contain historic structures and could be seen as an historic settlement cluster. This cluster also contains a possible grave site (**SB6**) and has been allocated a medium-high heritage significance. However, the location of this historic settlement cluster, which is situated outside the development footprint of the PV facility (although within the boundary of the preferred alternative, Site 1), has resulted in it being assigned a low-moderately detrimental impact significance.

Palaeontological resources

The fieldwork confirmed the presence of loose blocks of dolomite with very well defined small-scale stromatolite structures and a limited number of boulders containing cave breccia. Due to the limited outcrops it is not possible to determine the source bedrock of these local blocks of material on site.

No sites or areas of high palaeontological sensitivity or no-go areas have been identified within the study area for each project component and no significant bedrock exposure has been recorded in the geotechnical report commissioned by Sibanye Gold to warrant further immediate mitigation for palaeontological heritage.

There are no objections on general archaeological or palaeontological heritage grounds to any of the alternative sites for the proposed PV facility that would form part of the Sibanye PV project. However, as set out above, Site 3 has been identified as the least preferred alternative site based on heritage resources and other criteria.

No sites or areas of high archaeological-historical or palaeontological sensitivity or no-go areas have been identified within the study area for any of the project components.

1.1 Recommendations: PV Preferred Alternative Site 1

It is concluded that the proposed PV facility can be developed on Site 1 subject to the following conditions:

- Historical Structures

  If they cannot be avoided with at least a 20 m buffer, the significant historical structures identified (**SB3-8**) must be mitigated well in advance of construction.
- Possible Graves

  Prior to construction, the two possible graves (**SB6**) should be tested to see whether they are graves or not. If they are then they will require *in situ* preservation and avoidance as per SAHRA requirements. A buffer of 20 m is suggested if avoidance and protection occurs.

- Palaeontology
  - Should any sinkhole structures be identified, the Palaeontologist should be informed.
  - If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccia are found, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with:
    - 1. Recording and collection of stromatolite information; and
    - 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.
  - All areas identified in the geotechnical reports where significant bedrock might be exposed (> 1.5 m excavations) should be monitored for fossil remains by the responsible Environmental Control Officer (ECO). Should substantial fossil remains, such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably *in situ*, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material, as well as associated geological data (*e.g.* stratigraphy, sedimentology and taphonomy) by a professional palaeontologist.
  - A finds management protocol needs to be developed for construction activities.
  - If no significant fossil finds (see glossary) are recorded, no further mitigation for palaeontological heritage is required.

1.2 Recommendations: PV Preferred Alternative Site 2

It is concluded that the proposed PV facility can be developed on Site 2 or a portion thereof, subject to the following conditions:

- Palaeontology
  - Should any sinkhole structures be identified, the Palaeontologist should be informed.
  - If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccia are found, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer be appointed to do a Phase 2 PIA investigation with
    - 1. Recording and collection of stromatolite information; and
    - 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.
  - During the construction phase all deep (> 1.5 m) bedrock excavations should be monitored for fossil remains by the Environmental Control Officer (ECO). Should substantial fossil remains such as vertebrate bones and teeth, petrified wood, plant-

rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably in situ, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology and taphonomy) by a professional palaeontologist.

- A finds management protocol needs to be developed for construction activities.
- If no significant fossil finds (see glossary) are found, no further mitigation for palaeontological heritage is required.

2 CONCLUSIONS

This impact assessment has identified several types of historical and palaeontological resources as the main heritage resources that might be affected by the proposed development. A number of these heritage resources will require further intervention prior to the commencement of construction, but there are no fatal flaws to the proposed development of the PV facility or transmission routes proceeding. None of these heritage resources are of exceptionally high significance, although the possible graves on Site 1 are of high significance and will need to be mitigated.

Even if sites of palaeontological significance are found, there is very little danger of a fatal flaw that cannot be successfully mitigated. None of the presently observed palaeontological resources are of exceptionally high significance, although if cave breccia sites or stromatolites are uncovered, they might need some mitigation measures. This mitigation will reduce the significance of impacts to minor negative or positive, as new finds of cave breccia will contribute significantly to our knowledge of the past eco-systems and the rise of humankind in this part of Africa.

In all cases, mitigation will reduce the significance of impacts to low and the one very important site (informal graveyard on Site 3) will almost certainly be avoided. There are no preferences in terms of the type of technology to be employed since all would present similar impacts to heritage resources.

3 INTRODUCTION

PGS Heritage (Pty) Ltd was appointed by Aurecon South Africa (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), which forms part of the Scoping Report (ESR) for the proposed 200 MW Photovoltaic Energy Facility development proposed for Sibanye Gold in Westonaria Local Municipality, Gauteng.

3.1 Scope of the Study

The aim of the study is to identify and assess possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment (HIA) aims to inform the Scoping Report (SR) and the development of a comprehensive Environmental Management Programme (EMPr) to assist the developer in managing the identified heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (NHRA) (Act No. 25 of 1999).

3.2 Specialist Qualifications

This HIA was compiled by PGS Heritage. The members of staff of PGS have a combined experience of nearly 70 years in the heritage consulting industry and have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where the staff members have the relevant expertise and experience to undertake that work competently.

Jennifer Kitto, Project Manager and Heritage Specialist for this project, has 17 years' experience in the heritage sector, a large part of which involved working for a government department responsible for administering the NHRA. Therefore, she is well-versed in the legislative requirements of heritage management. She holds a BA in Archaeology and Social Anthropology and a BA (Hons) in Social Anthropology.

Mr Wouter Fourie, the Project sponsor, 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).

Dr Gideon Groenewald has a PhD in Geology from the Nelson Mandela Metropolitan University (1996) and the National Diploma in Nature Conservation from the University of South Africa (1990). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles

in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

4 BACKGROUND

4.1 Project Description

The project is the proposed development of a new 200 MW Photovoltaic Energy Facility for Sibanye Gold. Generally a 200 MW PV facility would require a footprint area of approximately 600 ha (based on a calculation of 3 ha per MW). Sibanye Gold initially identified three alternative sites for the proposed facility based on various main criteria, including:

- Land availability and ownership;
- Size of the land; and
- Distance to existing substations, in particular the Libanon, Midas and East Drie Gold Substations.

Based on the above criteria, the three alternative sites below were selected for the PV facility. These are sites which vary in size and are located on various portions of land (**Figure 3**). The sites identified belong to the Far West Rand Dolomitic Water Association (FWRDWA), of which Sibanye Gold is a member.

Coordinates	**S26°21'45.86"; E27°34'3.59"**	
Property	The general study area is located on the following properties (initially three site alternatives were assessed): • Site 1 – blue area in **Figure 3**. Located on Farm Uitval 280 (portions 1, 2, 4, 5, and 6) immediately north of the R501 • Site 2 - yellow area in **Figure 3**Figure 3. Located on Farm Uitval 280 (portions 8, 9, 10 and 11) immediately south of the R501. • Site 3 - red area in **Figure 3**. Located on Farm Leeuwpoort 356 (portions 70 and 71), and Farm Doornkloof 350 (portion 5), to the north of the N12. • Various transmission line route options were also assessed (Option 1, Option 2 and Option 3)	
Location	The general study area is located approximately 17 km from the centre of Carletonville to the west and approximately 50 km from Johannesburg to the east, along the R501, in the Westonaria Local Municipality, Gauteng Province (**Figure 2**).	
Extent	The extent of the total study area is roughly 2248 hectares, comprised of three initial site alternatives and excluding the various transmission line options: • Site 1 - approximately 851 ha • Site 2 - approximately 775 ha • Site 3 - approximately 622 ha	
Land Description	The areas investigated are all currently used, either predominantly or partially, for agriculture. Dryland crop production, specifically maize, is undertaken on Site 1 and in the northern region of Site 2 (**Figure 3**). The small south eastern area of Site 3 is used for crop production, while the western region of Site 3 is used for livestock grazing.	

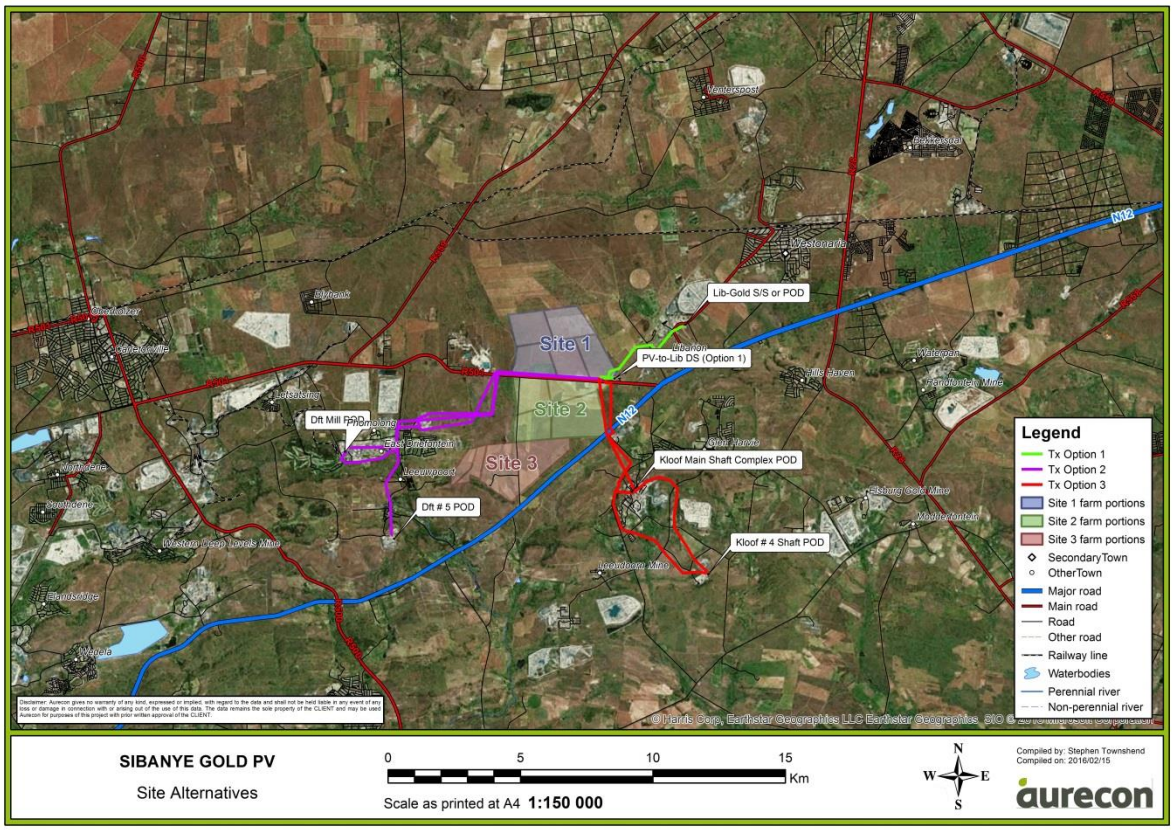


Figure 2 - Regional location of the study area (coloured polygons), also showing associated transmission line corridors

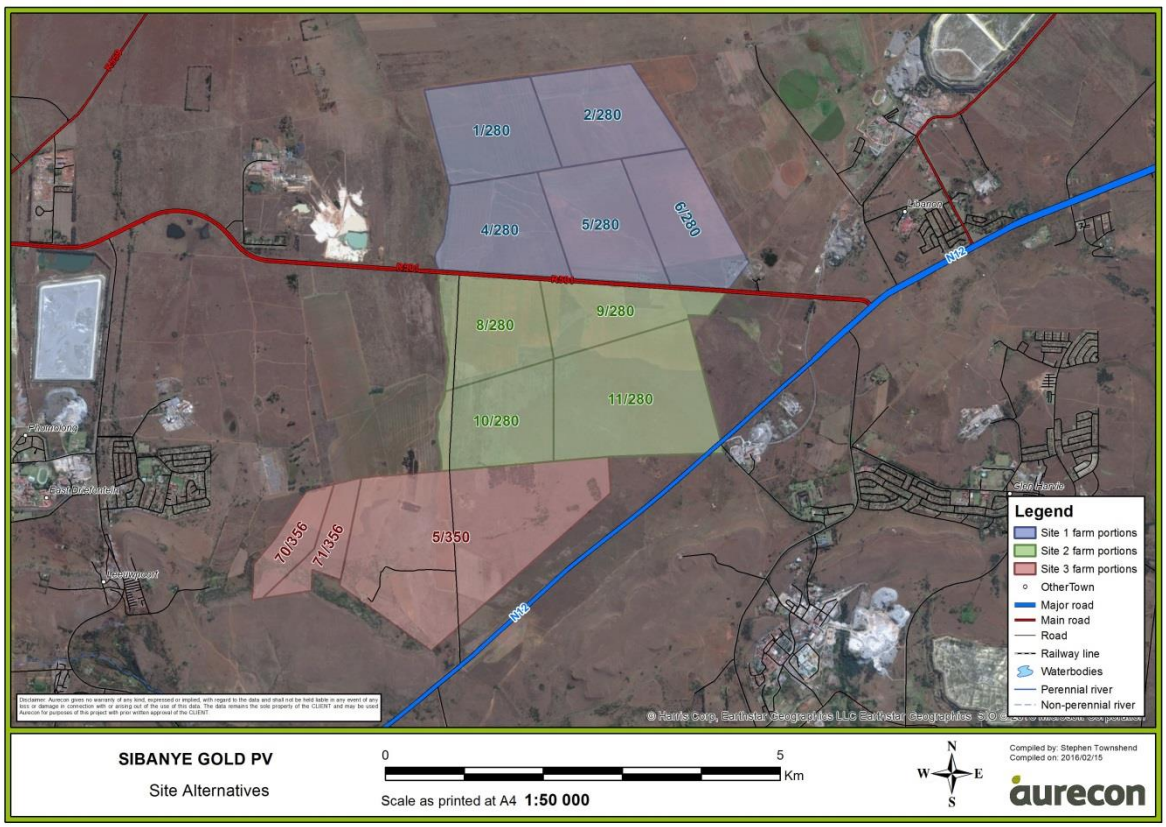


Figure 3 – Closer view of the study area, showing the three initial alternative sites (Site 1, Site 2 and Site 3)

4.2 Terms of Reference

The purpose of the specialist study was to undertake a Phase 1 HIA of the study area and recommend mitigation measures for any heritage resources identified which would be adversely affected by the development of the proposed 200 Megawatt Photovoltaic Energy Facility. The terms of reference included the following:

1. Describe the existing area to be directly affected by the proposals in terms of its current cultural, historical, archaeological and palaeontological characteristics and the general sensitivity of these components to change.
2. Describe the likely scope, scale and significance of impacts on the cultural, historical, archaeological and palaeontological components as may be associated with the proposals.
3. Describe the likely scope, scale and significance of impacts on the cultural, historical, archaeological and palaeontological components of the area associated with the construction process.
4. Make recommendations on the scope of any mitigation measures that may be applied prior to and/or during construction to avoid/reduce the significance of the identified construction-related impacts.
5. Describe the likely scope, scale and significance of impacts associated with the operation or use of the proposed Photovoltaic Energy Facility on the cultural, historical, archaeological and palaeontological components, including the benefits and detrimental effects.
6. Make recommendations on the scope of any mitigation measures that may be applied to avoid/reduce the significance of the operations-related impacts. These mitigation measures could also be design recommendations, operational controls, monitoring programmes, management procedures and the like.
7. It will be particularly important to identify any rehabilitation measures that should be reasonably applied with the completion of the construction works.
8. Broadly describe the implications of a 'No-Go' option where the proposed development is not established.
9. Comment broadly on the cumulative cultural, historical, archaeological and palaeontological impacts associated with the proposal.
10. Confirm if there are any outright fatal flaws to the establishment of the proposals at the proposed project from a cultural, historical, archaeological and palaeontological perspective.
11. Use desktop studies and a site visit, as appropriate and necessary, to achieve the objectives described above.

5 APPROACH TO STUDY

5.1 Outline of Methodology and Information Reviewed

5.1.1 Methodology for site selection

At the onset of the process, a one-day site visit and Multi-Criteria Site Selection Workshop was undertaken by Aurecon South Africa on 5 and 6 August 2015 respectively, to collect the necessary information and objectively determine the preferred site for the proposed PV facility. The aim of the site visit was to determine the status quo and identify any sensitive features or resources that could be negatively affected by the proposal at the three alternative sites.

The Multi-Criteria Site Selection Workshop was a forum for discussion amongst the project team, where specialist and professional input was given with regard to the following:

- The technical aspects of the proposal;
- Biophysical and social considerations;
- Any fatal flaws observed on site;
- Threats to and opportunities that exist for the proposal; and
- Any legal aspects that may hamper the proposed development or its authorisation.

Input into the process was based on the following:

- Basic initial desktop review of available information of the project and area;
- Discussions with Sibanye Gold and selected stakeholders;
- Screening level site visit to each site; and
- Expert knowledge, based on qualifications and experience.

Aurecon subsequently completed the Site Selection Report (Aurecon 2015) based on the results of the site visits and workshop. A clear preference for alternative Site 1, followed by alternative Site 2, was obtained. Based on an integrated analysis of technical, biophysical and socio-economic criteria, it was recommended that Site 1 and Site 2 be assessed in the EIA study.

After consideration of all factors that potentially affected the available area of the sites (including sensitive heritage and ecological features, servitudes for future roads, etc.), Aurecon produced a map (shown in **Figure 4**), showing resulting available areas of these sites.

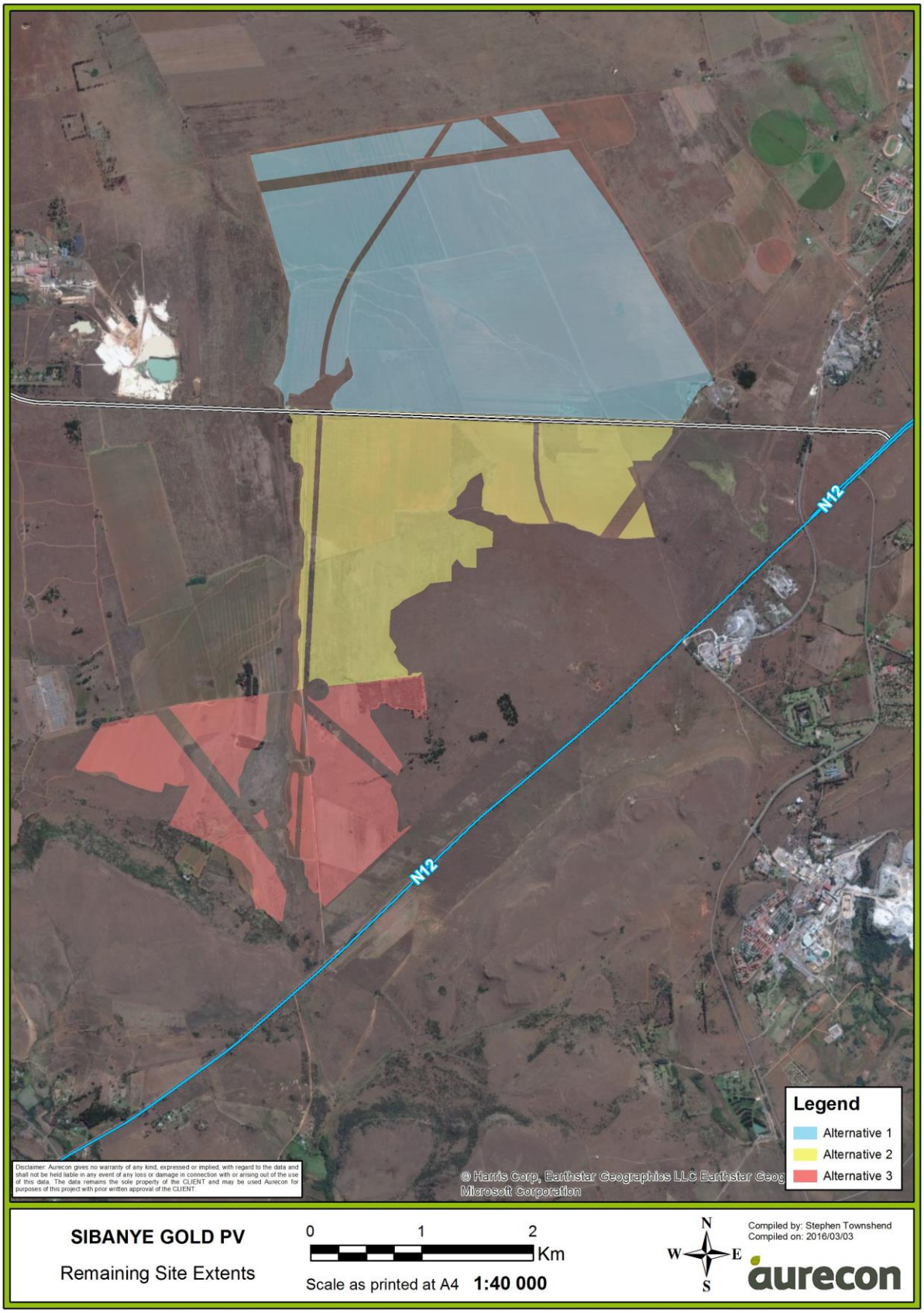


Figure 4 – Remaining available areas for the three sites, taking into account the services, infrastructure, sensitive features and buffers

5.1.2 Methodology for Assessing Heritage Site Significance

The applicable maps, tables and figures are included as stipulated in the NHRA and the NEMA. The HIA process conducted by PGS Heritage consisted of three steps:

Step I – Literature Review: The background information to the field survey leans greatly on the archival and historical cartographic material assessed as part of the study, as well as a study of the available literature. A desktop Palaeontological Impact Assessment was undertaken by Gideon Groenewald, a qualified palaeontologist.

Step II – Physical Survey: A physical survey was conducted over several days. The dates were: first survey on Monday 7 and Tuesday 8 December 2015, second survey on Monday 25 January 2016 and Tuesday 2 February 2016. The fieldwork was conducted by an archaeologist and two field assistants, by vehicle and on foot. The palaeontological fieldwork component of the PIA was completed on Saturday 16 January 2016. A systematic survey of the study area was undertaken by a fieldwork team comprising two palaeontological specialists, by vehicle and on foot.

Step III – Report: The final step involved the recording and documentation of relevant heritage resources, assessment of resources regarding the heritage impact assessment criteria, report writing, mapping, and recommendations.

5.1.3 Heritage significance rating scale

The significance of heritage sites was based on five main criteria:

- site integrity (i.e. primary vs. secondary context),
- amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
    - Low - <10/50m^2
    - Medium - 10-50/50m^2
    - High - >50/50m^2
- uniqueness and
- potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate development position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

5.1.4 Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report (see **Table 2** and **Table 3**).

Table 2 - Site significance classification standards as prescribed by SAHRA

Field Rating	Grade	Significance	Recommended Mitigation
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High/Medium	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium	Recording before destruction
Generally Protected C (GP.C)	Grade 4C	Low	Destruction

Table 3 - Site significance classification standards for Palaeontology as prescribed by SAHRA

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond *et al* (2008) and Groenewald *et al.,* (2014)	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.

GREEN	Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example, areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) recommended.
BLUE	Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. Collection of a representative sample of potential fossiliferous material recommended.
GREY	Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during implacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits.

6 ASSUMPTIONS AND LIMITATIONS

The aim of the assessment is to identify the possible types of heritage resources that might be present in the study area, as well as possible heritage sensitive areas for the locality of such resources. The assumption is that this report will inform the development of one final preferred area for the development of the proposed Sibanye Photovoltaic Panel Facility, out of the initial three site alternatives for the plant.

Upon the final site selection and the establishment of the possible layout designs, the fieldwork was completed on the identified areas.

Not detracting in any way from the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. Should any heritage features or objects not included in the 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.

7 LEGISLATIVE CONTEXT

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

i. National Environmental Management Act (NEMA) (Act No. 107 of 1998)
ii. National Heritage Resources Act (NHRA) (Act No. 25 of 1999)
iii. Minerals and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002)

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

i. GNR 982 of 2014 (Government Gazette 38282) promulgated under NEMA:
    a. Basic Assessment Report (BAR) – Regulations 19 and 23
    b. Environmental Scoping Report (ESR) – Regulation 21
    c. Environmental Impacts Assessment (EIA) – Regulation 23
    d. Environmental Management Programme (EMPr) – Regulations 19 and 23
ii. NHRA:
    a. Protection of Heritage Resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. MPRDA:
    a. Section 39(3)
iv. The Regulations Relating to the Management of Human Remains (GNR 363 of 2013 in Government Gazette 36473) promulgated under the National Health Act (Act No. 61 of 2003)
    a. Exhumation and Reburial of Human Remains - Regulations 26, 27 and 28

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…” In addition, the NEMA and the GNR 982 of 2014 state that, “the objective of an environmental impact assessment process is to … identify the location of the development footprint within the preferred site … focusing on the geographical, physical, biological, social, economic, cultural and heritage aspects of the environment” (GNR 982 of 2013, Appendix 3(2)(c)

emphasis added). In accordance with legal requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compliant HIA report is compiled.

8 BASELINE CONDITIONS

8.1 Desktop Study Findings

8.1.1 Archival and Historic Maps of the Study Area and Surrounding Landscape

Several historic maps that depict the study area were identified. These maps are presented below with short discussions on each.

1943 topographical map of the Carletonville area

Examination of this map indicated the presence of at least three sites with African huts and an associated kraal, together with several other historic structures within the study area (alternative Site 1), see **Figure 5**. No historic or archaeological sites or graves are indicated on alternative Site 2 (yellow polygon).

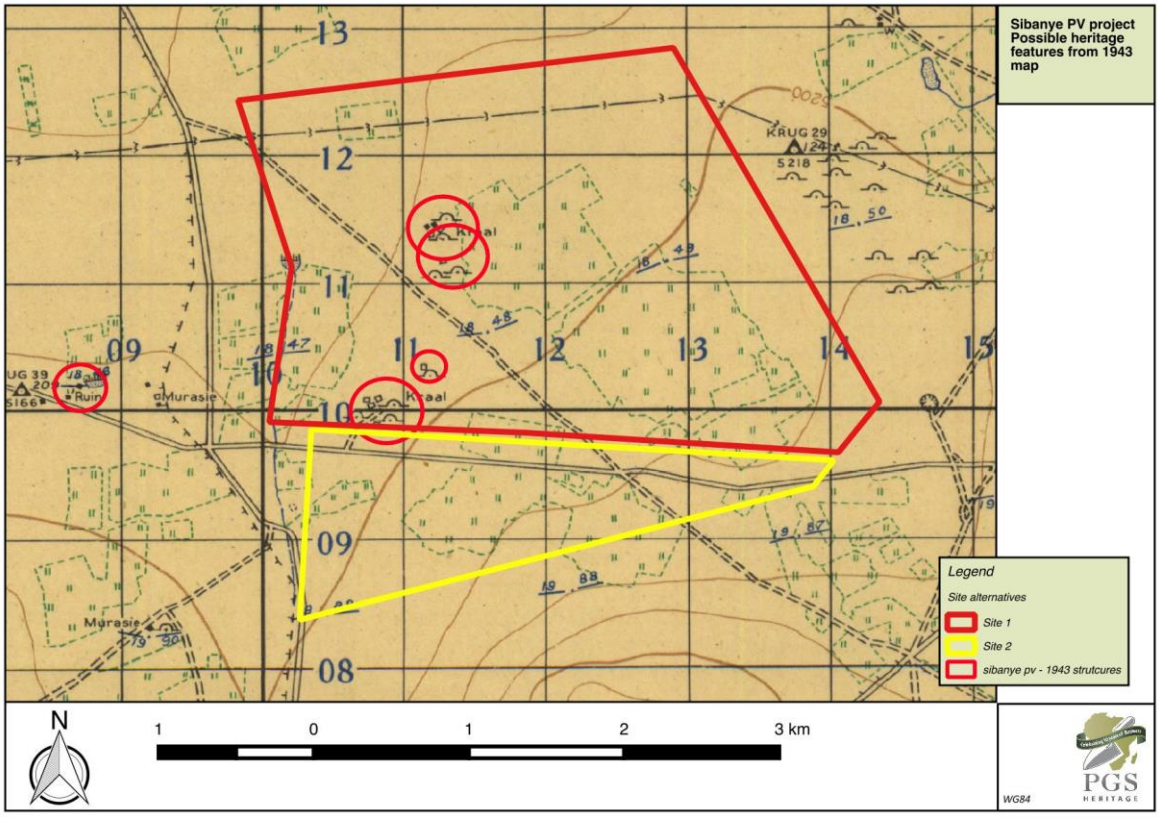


Figure 5 – 1943 Topographical map, showing the heritage sites as indicated at that date

1957 Topographical Map of the Carletonville area

This map shows that two of the sites indicated on the 1943 map still exist (located on alternative Site 1). The larger site on the 1957 map now indicates four structures, of which the centre structure is marked as a school building (**Figure 6**).

One African homestead is indicated on alternative Site 2 (yellow polygon).

The ruins indicated on the 1943 map are no longer indicated on the 1957 map, but two grave sites are now located in the same approximate position.

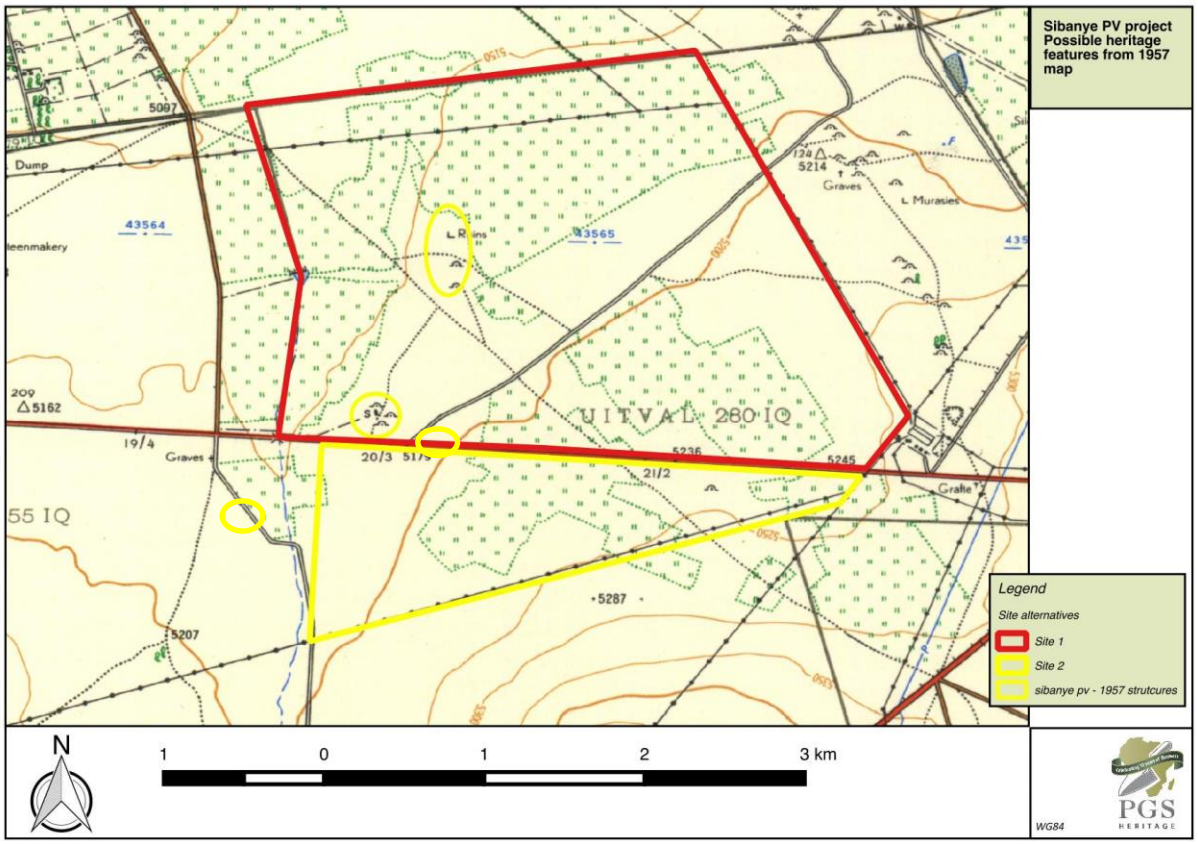


Figure 6 - 1957 Topographical map, showing the heritage sites indicated at that time

The results of the examination of these two historical maps were combined into a general Heritage Sensitivity Map that indicates the positions of all sites identified on those maps on a more recent map, which shows that several of the areas where the historical sites were located have since been disturbed by agricultural activity and the development of the East Driefontein and the Libanon/Kloof gold mines (**Figure 7**).

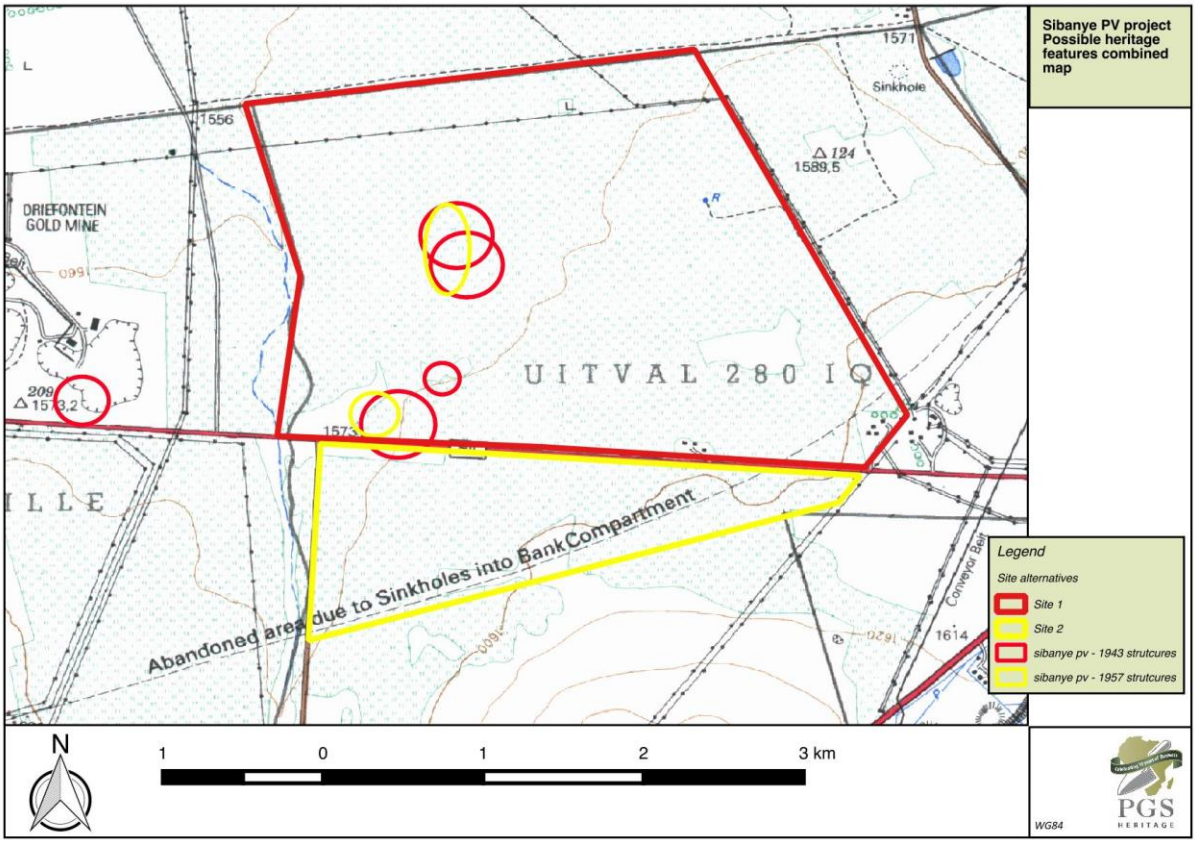


Figure 7 – Recent topographical map, indicating the location of the historical structures identified on the 1943 (red circles) and 1957 (yellow circles) maps respectively.

8.1.2 Historic Overview of Study Area and Surrounding Landscape

Date	Description
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA) 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 hammer stones. 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. Sporadic finds of ESA material has bene recorded to the east of the study sites around the Waterpan area (pers. comms – W Fourie).
250 000 to 40 000 years ago	The Middle Stone Age (MSA) is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique. No significant MSA sites are known in the region of the study area.
40 000 years ago to the historic past	The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths.

AD 1450 – AD 1650	The Ntsuanatsatsi facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the earliest known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by a broad band of stamping in the neck, stamped arcades on the shoulder and appliqué (Huffman, 2007).
AD 1500 - AD 1700	The Olifantspoort facies of the Moloko Branch of the Urewe Ceramic Tradition is the next Iron Age facies to be identified within the surroundings of the study area. The key features of the decoration used on the ceramics from this facies include multiple bands of fine stamping or narrow incision separated by colour (Huffman, 2007). The Gatsrand range that spans east to west from Orange farm in the east to the Potchefstroom in the west, is dotted with stone-walled complexes associated with the early farming communities. Studies by Fourie (1997) and Vorster (1969, 1983) have shown that the Gatsrand range, between Waterpan and Jachtfontein in the east and Glenharvie in the west, has been settled by the Bakwena-Bamare-a-Phogole since the 1700s up to the Difaqane.
1823 - 1827	During the so-called Difaqane, the Khumalo Ndebele (more commonly known as the Matabele) of Mzilikazi established themselves along the banks of the Vaal River (Bergh, 1999). Although the study area is located some 35km north of the Vaal River, it can be expected that the influence area of the Matabele would have included the study area as well. In c. 1827 the Matabele moved further north and settled along the Magaliesberg Mountains and in 1832 they settled along the Marico River.
1836	The first Voortrekker parties started crossing the Vaal River (Bergh, 1999).
November – December 1837	A commando of 330 Voortrekkers and a small group of Barolong under the command of Andries Hendrik Potgieter and Piet Uys attacked the Khumalo Ndebele of Mzilikazi in the vicinity of the Marico River. Of interest for this study is that they departed Lagerspoort near present-day Heidelberg and travelled via the present-day farm of Deelkraal (located roughly 8.3km west of the study area) to the Matabele settlements near the Marico River. During the attack some 500 Matabele were killed and 3000 cows taken by the Voortrekker commando. On their way back, the cows were divided amongst the members of the commando on the property today known as Deelkraal (Bergh, 1999).

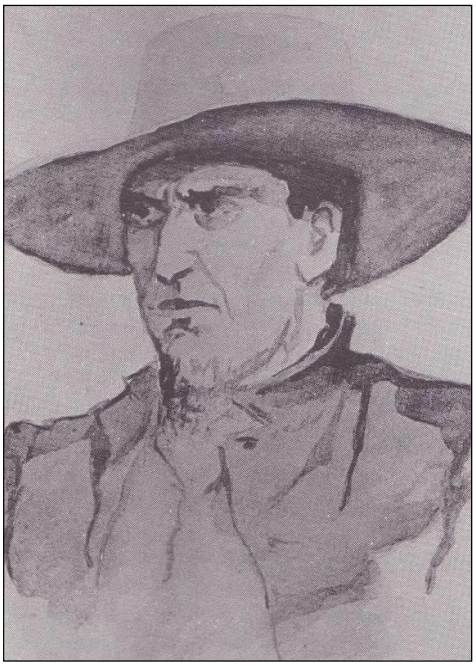


Figure 8 - Voortrekker leader Andries Hendrik Potgieter (Pienaar, 1990: 136). As indicated in the text, he oversaw the construction of the fort a few kilometres south of the study area in 1842.

1839 - 1840	These years saw the early establishment of farms by the Voortrekkers in the general vicinity of the study area. The district of Potchefstroom was also established in 1839 (Bergh, 1999), of which the study area formed part.
1842	Just before the occupation of Natal by the British, Commandant-General A.W.J. Pretorius of the Natal Voortrekkers appealed to the Voortrekkers in the interior of the country to come to their aid. As a result a stone fort was built on the farm Elandsfontein by Voortrekkers under the leadership of Commandant-General A.H. Potgieter to protect the women and children, should the men mobilise to defend Natal (Oberholster, 1972). In the years between 1934 and 1969 the then Historical Monuments Commission declared the fort as a Historical Site. This fort is located 3.7km south of the study area.
c. 1892 – c. 1900	A mail coach overnight station and post office was operated by the Wolvaardt family on the farm Elandsfontein. The famous Zeederberg Mail Coach, which ran between Johannesburg and Potchefstroom, used this point as an overnight station and rested its horses here (Birkholtz, 2008). The original stables are located some 900m south-west of the present study area.
1898 Early Gold mining activities	In 1898 the first gold-mining activity occurred when the Pullinger brothers started drilling boreholes and intersected the Ventersdorp Contact Reef (VCR) and Middelvlei Reef (MR) at depth. In 1909 a shaft was sunk, but it unfortunately flooded with water from the dolomites, and was abandoned (https://www.sibanyegold.co.za/operations/kloof/history).
1899-1902	The South African War took place during this time. No evidence for battles or skirmishes from within the study area was found during the desktop study.

	However, evidence was found for a skirmish that took place 1.1km to the south of the study area. An ambush was planned for the morning of 5 September 1900 by Commandant Danie Theron and his scouts and General Liebenberg and members of the Potchefstroom Commando. They had acquired intelligence that a large British convoy comprising 1,000 men would be moving from Johannesburg to Potchefstroom, and was expected to pass along the wagon road leading past the Wolvaardt farmstead on the morning of 5 September 1900. The plan of attack was for the men under the command of General Liebenberg and Commandant Danie Theron to ensconce themselves on separate high points next to the wagon road. However, by 8am on the morning of the ambush General Liebenberg was nowhere to be seen. Theron and one of his men by the name of Nel first went to the hill where Liebenberg was supposed to be without finding him, before going to the nearby farmsteads (including the Wolvaardt farmstead) to enquire from the families residing there whether they had seen Liebenberg. He subsequently went to the foot of the ridge directly south of the wagon road and, leaving Nel at its base with their horses, climbed to the summit to see if Liebenberg was there. As he reached the summit Theron was shocked to find seven members of a British scouting force. He immediately started firing and killed three of the British soldiers, before finding shelter in stone structure nearby. At this point he observed the British column coming into view from Johannesburg, and seemingly to bluff the commanders of this column into thinking a whole Boer commando was positioned on top of the hill, Theron started firing rapidly at the column. The British forces unhooked their howitzers and started shelling the summit of the hill. Theron was struck by shrapnel erupting from a shell that hit a rock near his position, and was killed. When the British finally climbed the hill they found four dead bodies on the summit, three dead British scouts and one badly mutilated Boer. The British forces subsequently buried Theron on the border between the farms Buffelsdoorn and Elandsfontein, with the three British soldiers whom he had killed. On 15 September 1900 his men exhumed his body and buried him in the Pienaar family cemetery on the farm Elandsfontein. After the war his men exhumed his body and on 10 March 1903 buried him next to the grave of his fiancé Hannie Neethling at Eikenhof, south of Johannesburg (Malan, 1939) (Breytenbach, 1950).
1930-32	After a period of 30 years the discovery of the West Wits Line goldfields contributed in large amount to the revival of the gold industry. Guy Carleton Jones, the consulting engineer for Goldfields, and Dr Leopold Reinecke, Goldfield's consulting geologist, hired Dr Rudolph Krahmann to conduct a magnetic survey of the farms that lay to the south-west of Randfontein. This

	was an attempt to trace and plot the magnetic shale beds of the Lower Witwatersrand System, which might lead to the discovery of underlying gold-bearing conglomerates. The magnetic survey did prove that magnetic shales existed at depth in the area south-west of Randfontein. This led to Goldfields securing options over a large belt of land that covered 30 000 mining claims and stretched 50km from the west of Randfontein to the Mooi River. Due to the effects of the Depression on the South African economy, the only other mining house willing to invest in the potential new goldfield was Anglo American. The subsidiary company West Witwatersrand Areas Limited was subsequently established on 12 November 1932, with the assistance of Anglo American. The institution of an extensive drilling programme by West Wits intersected payable reef in 21 boreholes and revealed the existence of two new gold-bearing conglomerates: the Ventersdorp Contact Reef and the Carbon Leader Reef (Davenport, 2013).
1934-1939	Venterspost Mine: In 1934 shaft sinking commenced at Venterspost using the newly developed cementation process to prevent the shaft from being flooded with water from the dolomitic rocks overlying the gold reef. In 1939 the crushing of ore began and the first gold from the West Wits goldfield was poured at Venterspost Mine (https://www.sibanyegold.co.za/operations/kloof/history)
1936-39	In 1936, shaft sinking began at Libanon mine. However, the sinking of Libanon's second shaft was stopped in 1939 to curtail capital expenditure, and the mine closed for the duration of WWII. (https://www.sibanyegold.co.za/operations/kloof/history)
1945	Exploration activities between 1933 and 1939 culminated in the registration of West Driefontein Mining Company Limited on 7 March 1945. Sinking of the No 1 and 2 shafts commenced (now the No 11 and 12 shafts). (https://www.sibanyegold.co.za/operations/kloof/history).
9 September 1950	The Danie Theron Monument was unveiled on the summit of the ridge where he died. The monument was designed by architect Mr. Hillebrands and was built by the company L. Fokkens (Pty) Ltd. The monument was built with funds collected by the Voortrekker organisation (Swart, 1989).

Early History of the Farms Situated in and Around the Study Area

By November 1838, many of Potgieter's group had settled in the environs of the Vet River, Winburg and across the Vaal River. In December 1838, Potgieter declared the region north of the Vaal River as trekker territory and settled his company along the Mooi River, 11 km north-east of the current Potchefstroom. This settlement was initially known as Potchefstroom and subsequently as Oude Dorp. However, poor soil conditions around the initial settlement contributed to a subsequent decision to opt

for a terrain farther to the south, where the present-day town of Potchefstroom was established in 1841 (Van Eeden, 1998).

According to the farm application register, commandant Potgieter had been allocating farms in the Mooi River district from as early as 3 June 1839. According to tradition, by the year 1836, one Harmse and his family had already settled on the terrain of the present-day farm Buffelsdoorn in the Gatsrand area.

Occupation of farms in Gatsrand, 1840-1849

Leeuwpoort	CM Erasmus	11.12.1847
Doornkloof	HC Marx	17.4.1848

After Britain's annexation of Natal in 1843, an increasing number of trekkers sought a future in the country to the north of the Vaal River, where they could pursue their dream of independence. After the establishment of the ZAR in 1857, this ideal was realised and it contributed to the further occupation of this area. Between 1858 and 1870, farms were allocated to 23 owners in the Gatsrand area (**Figure 9**):

Occupation of farms in Gatsrand, 1858-1870

Driefontein (614)	NM Prinsloo	28.7.1864

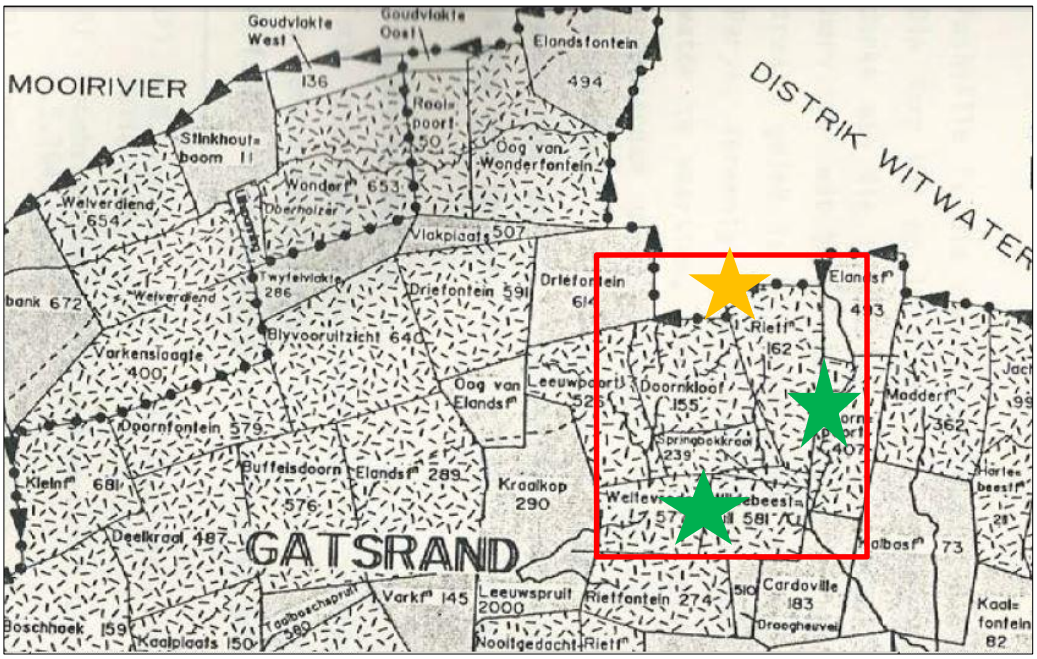


Figure 9 – Map of the farms established from 1839-1857 (green star) and 1858-1898 (orange star) in the Gatsrand area, with the study area outlined in red (Van Eeden, 1998)

8.1.3 Previous historical studies (HIA Reports from SAHRIS Database)

A search of the SAHRIS (SA Heritage Resources Information System) database identified the following Heritage Impact Assessment (HIA) and Palaeontological Impact Assessment (PIA) reports for the study area and general surrounding region:

- *Prof TN Huffman, Mr GS Kruger & Ms HD van der Merwe. 1993 Archaeological Survey of the Mines Venters Post, Libanon, Leeudoorn and Kloof. Archaeological Resources Management - University of the Witwatersrand, Johannesburg*

  This study identified several sites dating to the Late Iron Age and Historic periods on the four mine properties. A Late Iron Age complex at Leeudoorn and a European cemetery at Venterspost were identified as being in imminent danger and requiring urgent mitigation. Only the sites on the two mine properties associated with the PV plant study area are noted here.

  Libanon Mine
  Most of the archaeological sites on this property are historic stone kraals varying in shape and size. Two cemeteries were also located in the area. One contained about 33 graves, mostly informal, with some dates ranging between the 1930s and 1940s. A second cemetery contained about 70 graves.

  Kloof Mine
  A series of historic stone kraals was identified along the slope of the northern boundary ridge on this property. Another site was situated at the same level on the opposite ridge to the south. Various sites in the southern and western sections are all small stone and mud structures varying from one to two rooms. Some of these sites had stone kraals associated with them. One site had a grave marked by a stone cairn associated with a small house nearby.

- *Huffman TN, HD Van Der Merwe and R Steel. 1994. Archaeological survey of the East and West Driefontein Mines. Archaeological Resources Management - University of the Witwatersrand, Johannesburg*

  Eight sites were found on East Driefontein and eleven on West Driefontein. They range from Middle Stone Age through Iron Age to the recent Historic Period. One Iron Age stone-walled site was partially destroyed when the No. 9 Shaft on West Driefontein was constructed. The survey included portions of the farm Driefontein 355 IQ. The East Driefontein Mine property produced two sites with Stone Age artifacts, three Iron Age sites and four historic structures.

- *Justin du Piesanie. 2012. Phase 1 Heritage Impact Assessment of the Proposed Geluksdal Tailings Storage Facility and Pipeline Infrastructure. Gold One International Limited.*

A total of eight cultural resources were identified, recorded and assessed. This included five graveyards and three historic built structure sites. All other built structures and burial grounds and graves that were recorded in previous impact assessments and during the survey were either younger than 60 years or located outside of the project area and were therefore not assessed.

- *J van Schalkwyk. 2014. Cultural heritage assessment for the Libanon 132kv Loop-In Line, Carletonville Region, Westonaria Magisterial District, Gauteng Province. For GIBB Engineering and Architecture.*

  No sites, features or objects of cultural heritage significance were identified in the development area.

8.2 Palaeontology

The study area is underlain by Vaalian aged stromatolitic dolomite of the Malmani Subgroup (Vmd), Chuniespoort Group as well as Vaalian aged quartzite of the Rooihoogte Formation (Vr) and ferruginous shale of the Timeball Hill Formation (Vt), Pretoria Group of the Transvaal Supergroup. Small areas are covered in Permian aged sedimentary rocks of the Ecca Group, Karoo Supergroup.

Almost the entire study area for the proposed development is underlain by rocks of the Vaalian aged Malmani Subgroup (Vmd) of the Chuniespoort Group, Transvaal Supergroup and small inliers of Permian aged Ecca Group sedimentary rocks. The substation adjacent to Site 1 is underlain by Vaalian aged quartzites of the Rooihoogte Formation (Vr) and ferruginous shales of the Timeball Hill Formation (Vt) of the Pretoria Group.

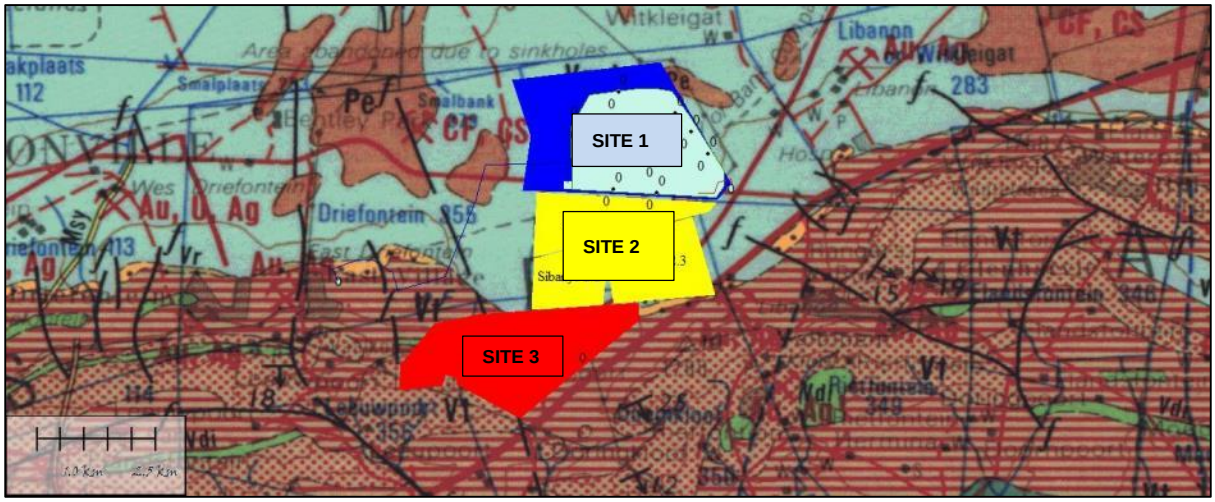


Figure 10 - Geology of study area, showing the three alternative PV sites

8.3 Palaeontology of Geological Formations

8.3.1 Transvaal Supergroup

Chuniespoort Group, Malmani Subgroup (Vmd): Range of shallow marine and lacustrine stromatolites (some very large), oolites, and pisolites in carbonates, filamentous and coccoid organic walled microfossils such as cyanobacteria in siliciclastics and carbonates, as well as cherts can be present in the Malmani Subgroup. The presence of stromatolite structures warrants the allocation of a Very High palaeontological sensitivity to the areas underlain by Malmani Subgroup sediments at the PV facility alternatives Site 1 and Site 2.

Dolomite areas are allocated a very high palaeontological sensitivity due to presence of karst topography and possible cave breccias with potential Homonin fossils. These formations may contain diverse Late Pliocene to Pleistocene (Makapanian, Cornelian, Florisian) mammalian biotas, including several extinct Homonins (spp. of Australopithecus, Paranthropus, Homo), micromammals, reptiles (lizards), frogs, birds, land snails, coprolites, stone and bone artefacts, plant remains (e.g. petrified wood, palynomorphs). A number of very important fossiliferous cave sites are, for example, present in dolomitic Cradle of Humankind, spanning part of the Gauteng and North West Provinces near Krugersdorp.

8.3.2 Pretoria Group

Rooihoogte Formation (Vr): Basal breccio-conglomerates, quartzites, mudrocks, carbonates (alluvial fan, lakes, karst infill). No fossils have to date been recorded from this formation. Small areas of PV facility alternative Site 3 are underlain by this formation and are allocated a Low Palaeontological sensitivity.

Timeball Hill Formation (Vt): The Timeball Hill Formation is interpreted as consisting of lacustrine and fluvio-deltaic mudrocks with diamictite, conglomerates, quartzite and minor lavas. Shale, siltstone, conglomerate and quartzite are abundantly present, with minor carbonate layers with stromatolites. The stromatolite structures are important indicators of palaeo-environments during the Vaalian times and need to be reported, if present.

8.3.3 Karoo Supergroup, Ecca Group

The Ecca Group sediments can contain significant fossilised remains of plants and even coal beds. These plant fossils are indicative of the palaeo-environments that occurred in this part of South Africa during the Permian times and need to be recorded, if present. Small areas in PV facility alternative Site 1 are underlain by these sediments.

If sandstone that might be equivalent to the Vryheid Formation is recorded, it may contain significant fossils. The Permian aged Vryheid Formation is mainly interpreted as a sandy shore deposit and fossils are mainly associated with event beds, with the commonest fossils being sparse to locally concentrated assemblages of trace fossils and abundant plant fossils (Johnson *et al* 2009). Body fossils are very rarely recorded.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are: *Azaniodendron fertile, Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia* sp., *Raniganjia* sp., *Asterotheca* spp., *Liknopetalon enigmata, Glossopteris* > 20 species, *Hirsutum* 4 spp., *Scutum* 4 spp., *Ottokaria* 3 spp., *Estcourtia* sp., *Arberia* 4 spp., *Lidgetonnia* sp., *Noeggerathiopsis* sp. and *Podocarpidites* sp.

According to Bamford (2011), little data has been published on these potentially fossiliferous deposits. Good fossil material is likely around the coal mines and yet in other areas the exposures may be too poor to be of interest. When they do occur, fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites. In the interests of heritage and science, however, such sites should be well recorded, sampled and the fossils kept in a suitable institution.

Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail by Mason and Christie (1986). It should be noted, however, that the aquatic reptile, *Mesosaurus*, which is the earliest known reptile from the Karoo Basin, as well as fish (*Palaeoniscus capensis*), have been recorded in equivalent-aged strata in the Whitehill Formation in the southern part of the basin (MacRae, 1999). Indications are that the Whitehill Formation in the main basin might be correlated with the mid-Vryheid Formation. If this assumption proves correct, there is a possibility that *Mesosaurus* could be found in the Vryheid Formation.

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Natal. The Karoo sediments are almost entirely lacking in body fossils but ichnofossils (trace fossils) are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In KwaZulu-Natal a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly Corophioides) which are assigned to ichnogenus Diplocraterion (Mason and Christie, 1986).

8.3.4 Palaeontological sensitivity

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged (**Figure 11**). The different sensitivity classes used are explained in **Table 3** above.

The Vaalian aged Malmani Subgroup dolomites underlies most of the PV facility Site 1 alternative site and this site is allocated a Very High rating for palaeontological heritage, except where a small area is underlain by sediments of the Ecca Group. The Malmani Subgroup also underlies the larger part of the study area referred to as alternative Site 2, with a Very High sensitivity for Palaeontological sensitivity. The alternative area referred to as Site 3 is partly underlain by rocks of the Very Highly sensitive Malmani Dolomite Subgroup. This area is also partly underlain by quartzites of the Rooihoogte Formation, allocated a Low Palaeontological sensitivity, and Timeball Hill formation, allocated a High sensitivity due to the presence of stromatolite structures, as well as the possibility of karst formation and formation of cave breccia that might contain remains of Homonin species, and the Ecca Group. The sedimentary rocks of the Ecca Group are allocated a High Palaeontological significance due to the reported abundance of plant fossils in this part of the Karoo Basin.

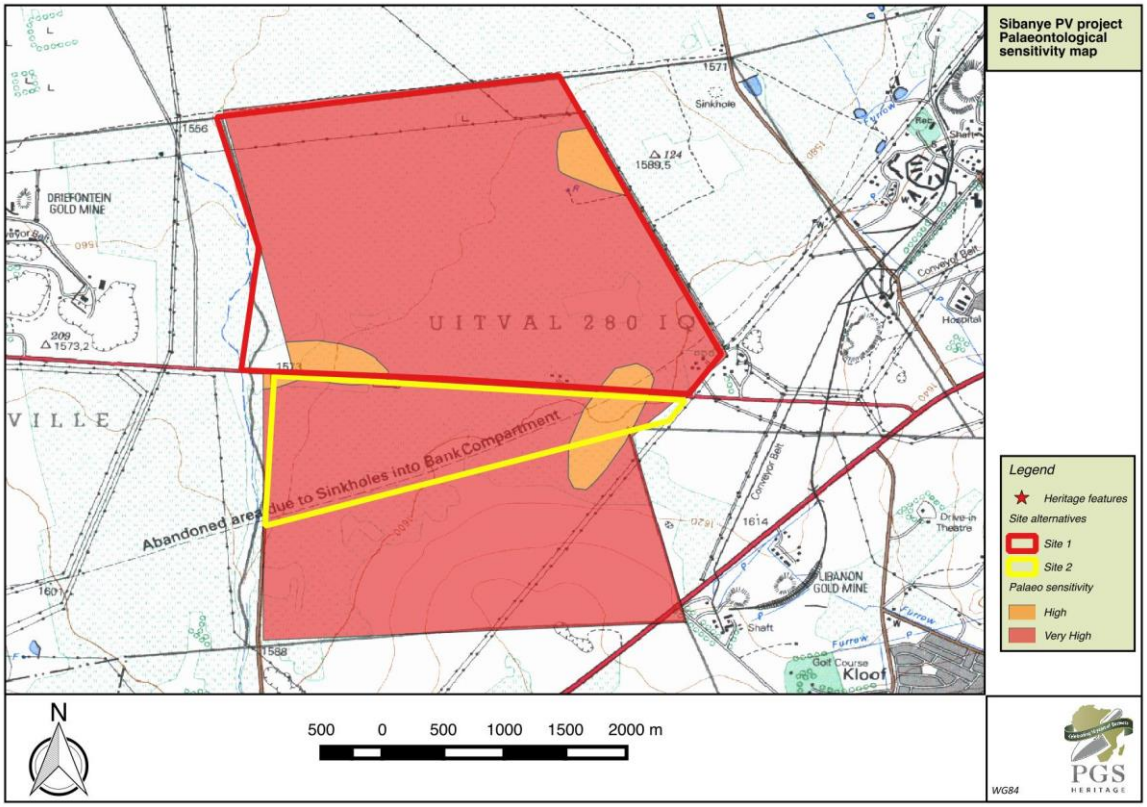


Figure 11 - Palaeontological sensitivity of the study area

8.4 Fieldwork Findings

As indicated above, there was an initial site visit undertaken to the study area together with representatives for Aurecon and other specialists. This site visit surveyed all three of the alternative sites at a screening level with the purpose of identifying any potential fatal flaws on the three alternative sites. This survey took place on 5 August 2015 and the results thereof were used subsequently in the multi-criteria site selection process to determine the two preferred alternative sites: Site 1 and Site 2 (Section 3).

The archaeological fieldwork component of the HIA was completed over several separate days. The dates were: first survey on Monday 7 and Tuesday 8 December 2015, second survey on Monday 25 January 2016 and Tuesday 2 February 2016. A systematic survey of the study area was undertaken by a fieldwork team comprising an archaeologist and a heritage specialist. The team was equipped with a hand-held GPS. Each of the two preferred site alternatives and the three transmission line alignment corridors were visited and inspected by foot and vehicle. Since the two preferred site alternatives are located on land that is mostly utilised for maize fields (which were ploughed at the time), the ground visibility was very good.

The palaeontological fieldwork component of the PIA was completed on Saturday 16 January 2016. A systematic survey of the study area was undertaken by a fieldwork team comprising two palaeontological specialists. The palaeontological specialists was equipped with a hand-held GPS, Each of the two preferred site alternatives was visited and inspected by foot and vehicle, as well as the three transmission line alignment options. Since the two preferred site alternatives are located on land that is mostly utilized for maize fields (which were ploughed at the time), the ground visibility was very good, but due to deep soil cover, no significant bedrock exposures of fossils were recorded. Well-defined small scale stromatolites and some potential cave breccia were recorded.

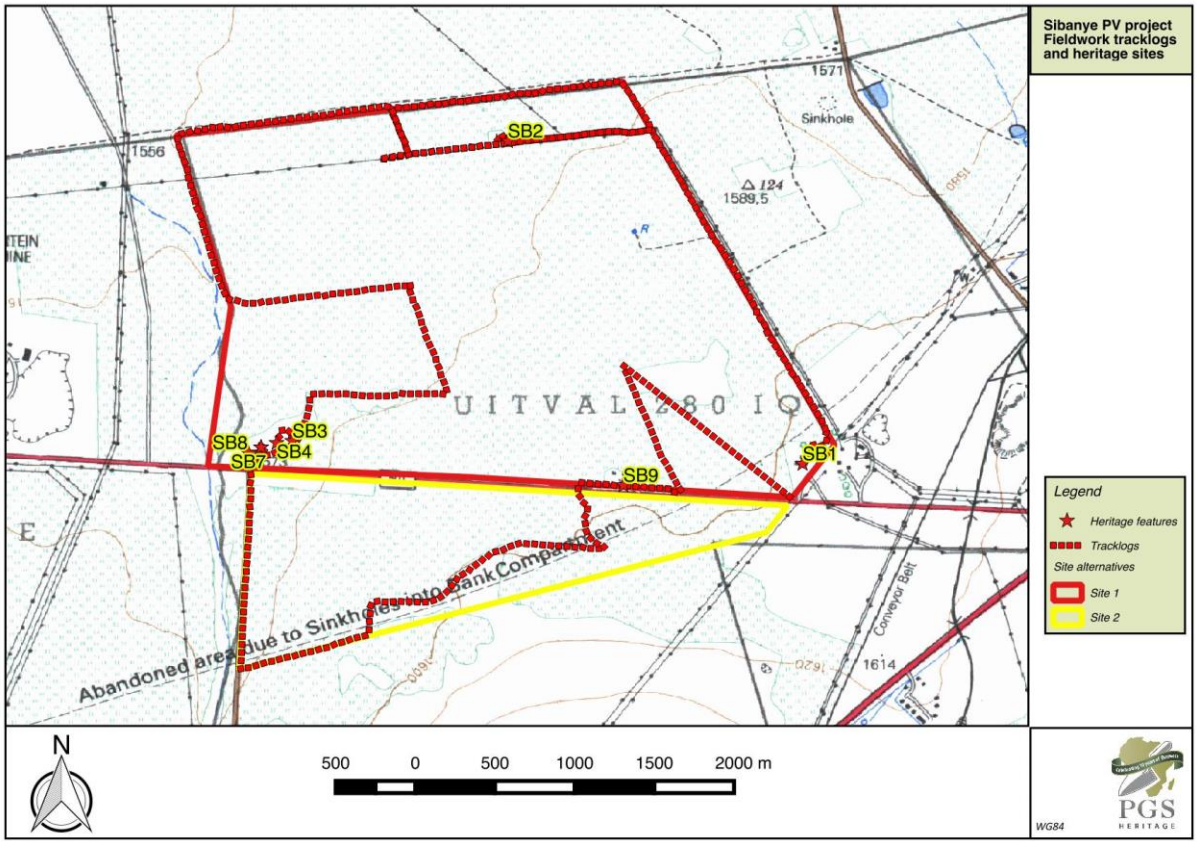


Figure 12 – Track log of Site 1 and Site 2, showing identified heritage sites

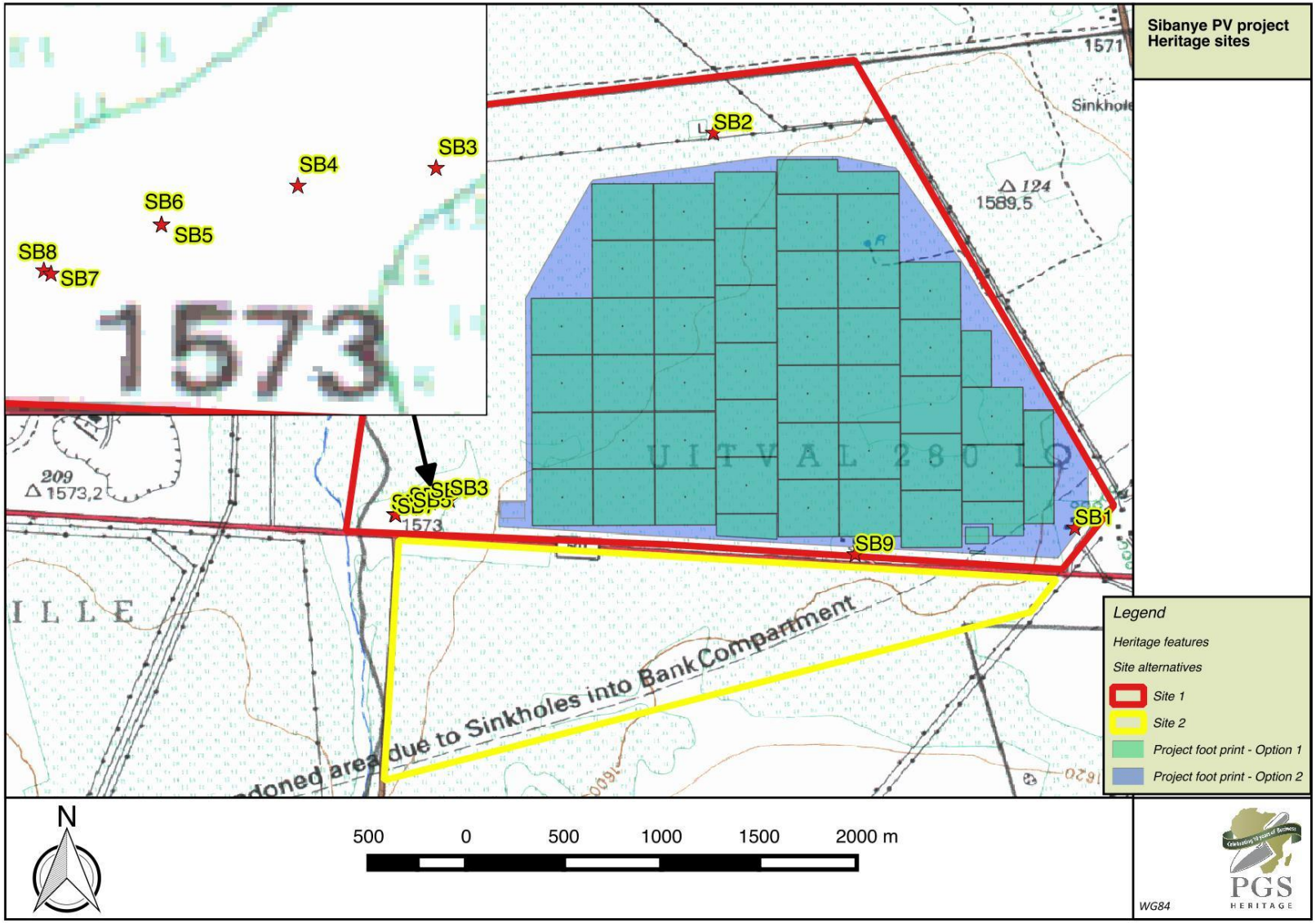


Figure 13 - *Map indicating the identified heritage sites, located on the preferred alternative – Site 1*

During the initial fieldwork survey, nine sites of varying levels of heritage significance were identified, all located on **Site 1**. Three of the heritage sites are of recent historic date and have a *negligible-neutral* heritage significance (**SB1**, **SB2** and **SB9**), while sites **SB3-SB8** could be seen as an historic settlement cluster. This site contains a possible grave site (**SB6**) which contributes to it having been allocated a *medium-high* heritage significance. However, when the location of this cluster of historic structures (outside the development footprint of the PV plant, although within the Site 1 boundary) is taken into account, this results in it being assigned a *moderate* impact significance.

8.4.1 Heritage Sites Identified within the Preferred Alternative Site 1

- **Site SB1** (GPS Coordinates: E27.58706, S26.36378)

The site consists of a recent historic farmstead with two sets of farmhouses and outbuildings. The buildings and structures are constructed from modern building materials such as steel, corrugated iron and fired clay bricks. The farmstead is occupied by Mr. van Wyk and his son. They have lived on the farm for the past 25 years.

Site Significance: The site has no heritage significance and no mitigation is necessary.

Figure 14 - One of the houses present at SB1

- **Site SB2** (GPS Coordinates: E27.56852, S26.34351)

Two ruined structures were identified at this locality. The first structure was utilised as the main house and consisted of three bedrooms, a kitchen, lounge, and bathroom. The second structure was the shed

and garage, consisting of a storeroom and single garage. A small midden is situated on the side of the garage building. The site is not depicted on the 1957 topographical map of the area.

Site Significance: The site has no heritage significance and no mitigation is necessary.

Figure 15 - View of SB2 from east

Figure 16 – View of the garage and store room at SB2

Figure 17 – View of main house at SB2

- **Site SB3 – SB5** (GPS Coordinates: SB3 - E27.55495, S26.36235; SB4 - E27.55495, S26.36235; SB5 - E27.55299, S26.36276)

The area around **SB3-SB5** consists of at least three stone-built ruins of single and double-roomed structures. A larger structure that consisted of at least three rooms is present at **SB5**. Evaluation of the 1943 map indicates that this site consisted of at least seven structures at that period; while the 1957 map indicates four structures, of which the center structure is marked as a school building.

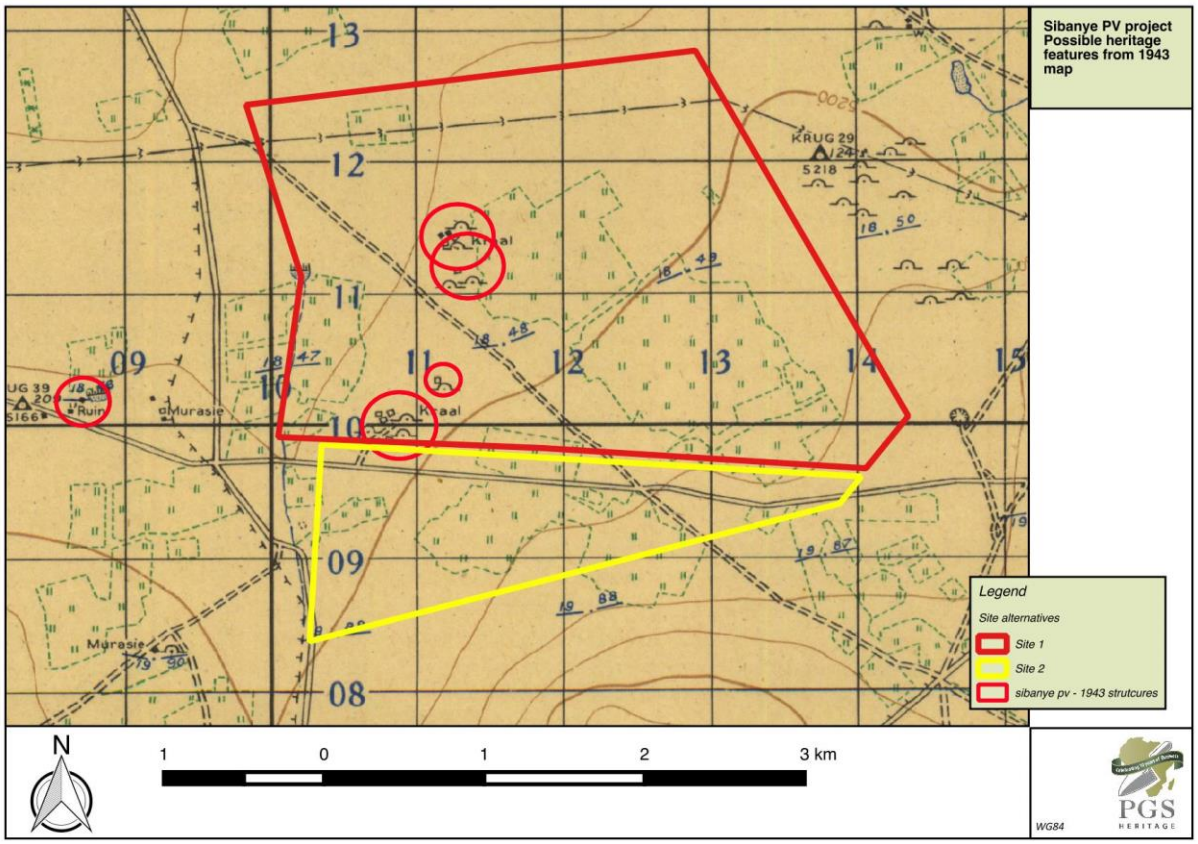


Figure 18 - Map analysis of 1943 topographical map

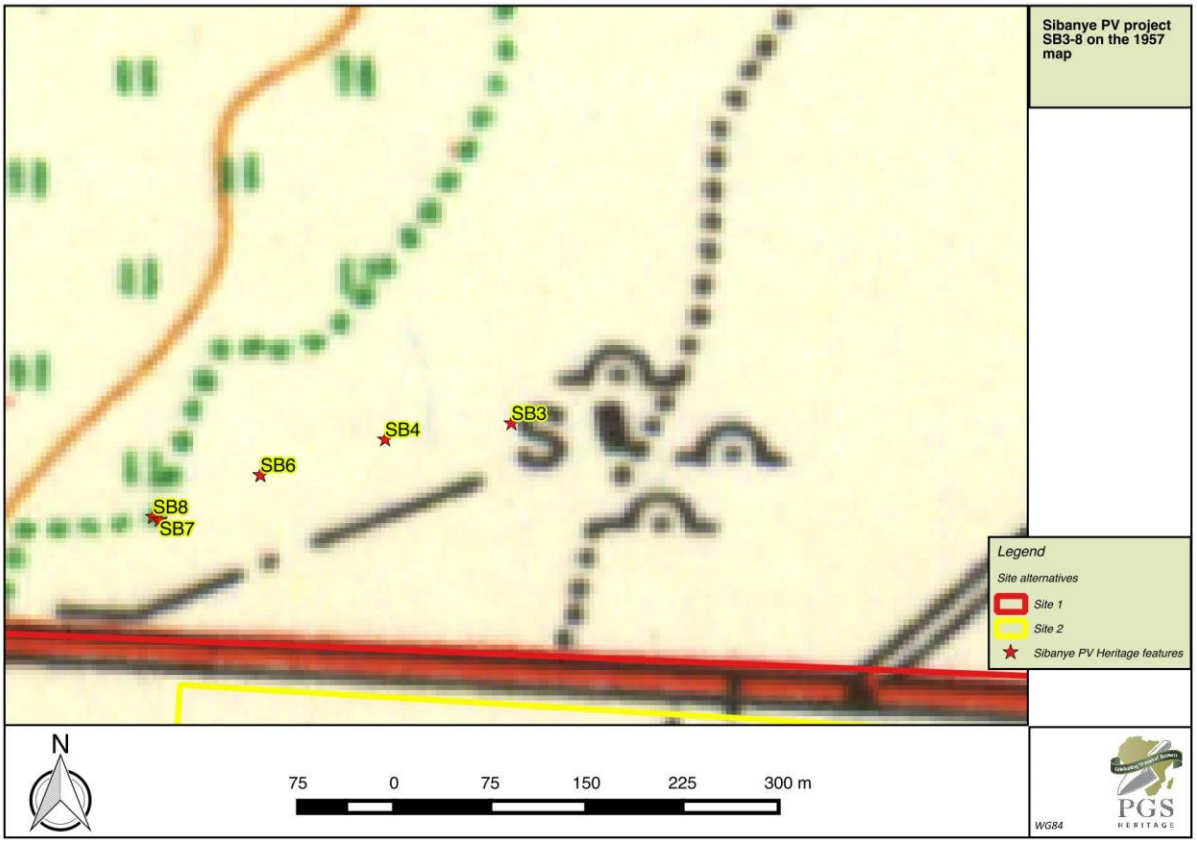


Figure 19 - Map analysis of the 1957 topographical map

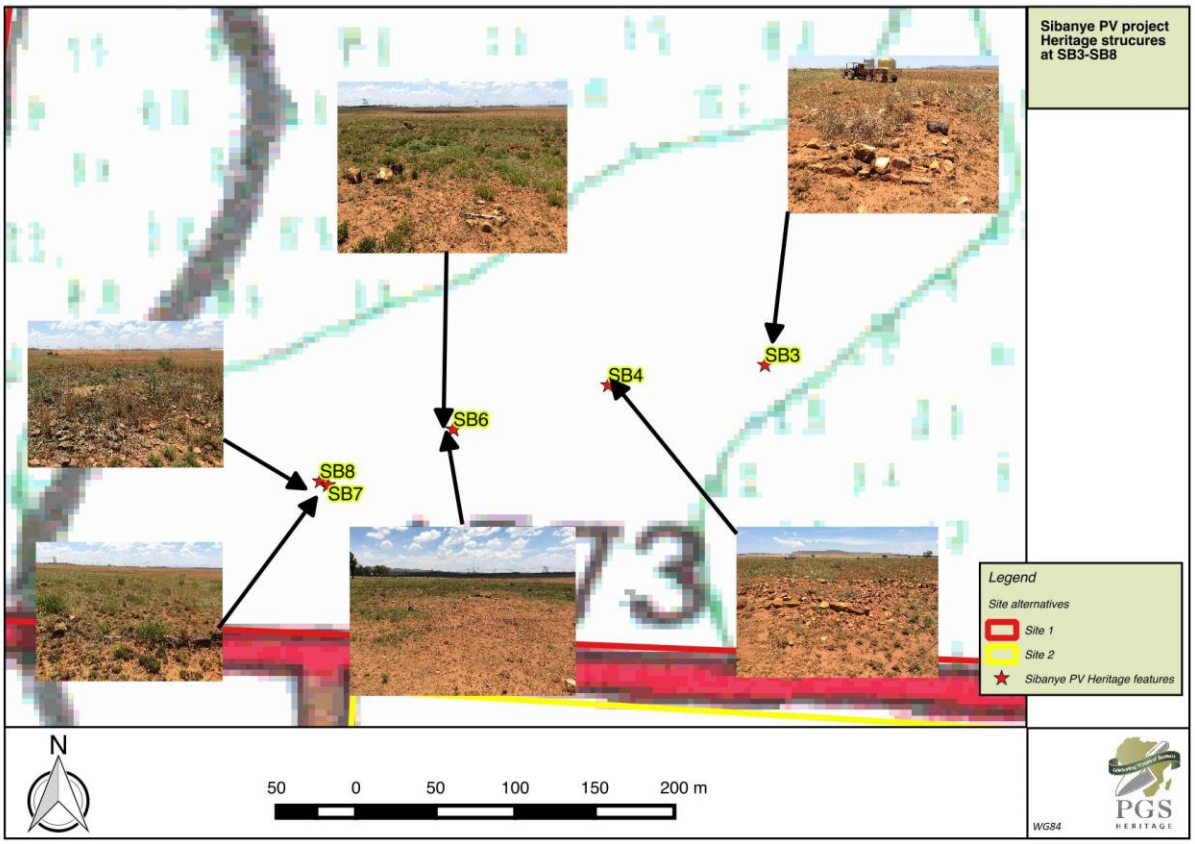


Figure 20 - Layout map of sites SB3-SB8

Site Significance*:* The combined heritage significance of the structures are graded as having a heritage significance of **4A – Generally protected**, and will require mitigation work if affected by the proposed development.

Mitigation: If the sites are to be affected by the proposed development, the structures will have to be documented through mapping and excavations to determine the layout and history of the site. Further archival research into the existence of the school will also be required. This mitigation can only be conducted after a mitigation permit has been issued by SAHRA under section 34 and 35 of the NHRA. Upon completion of the documentation, the applicant can apply for a destruction permit with the backing of the documentation report.

Figure 21 - View of SB3 from east

Figure 22 - View of SB3 from east

Figure 23 - Faint foundation at SB5

Figure 24 - View of the extent of the site at SB5

Site SB6 (GPS Coordinates: E27.55299, S26.36276)

The site is part of the larger **SB3-SB8** cluster of structures. It is characterised by two stone-packed structures, aligned east-west. The shape and alignment of the two stone packed structures indicate that both could be graves, associated with the settlement cluster.

Site Significance*:* The two structures are protected under section 36 of the NHRA and must be considered to be graves until otherwise determined. The sites are graded as having a heritage significance **as Locally Significant 3B** and will require mitigation work if affected by the proposed development.

Mitigation: If the sites are to be affected by the proposed development, the two possible graves will need to be removed. The grave relocation process requires that permits to be obtained from various authorities under the National Health Act (No 61 of 2003) and the NHRA. Upon completion of the relocation process, the developer can apply for a destruction permit with the backing of the relocation report.

Figure 25 - View of SB6 (Structures indicated in yellow)

- **Site SB7** (GPS Coordinates: E27.55299, S26.36276)

The site is the ruins of a single roomed structure, which was built with fired bricks and a cement floor. It is totally destroyed.

Site Significance*:* The site has no heritage significance and no mitigation is necessary.

Figure 26 - View of SB7

- **Site SB8** (GPS Coordinates: E27.55299, S26.36276)

The site is just south of **SB7** and consist of a semi-circle of stone-packed rocks. The rocks were packed as a double stone wall with pebble fill. An entrance on the eastern side of the wall is marked with a small raised platform. The layout and construction technique reminds of Early African farmer (Iron Age) settlements and the use of stone walling. However, there are no artefacts, such as pottery, that support this observation. The structure was most probably part of the larger cluster of structures and was utilised as a cattle pen.

Site Significance: The site has a low heritage significance and is graded as **Generally Protected 4B.**

Mitigation: The structure must be documented with **SB3-SB6**, in the event that the site is affected by the development.

Figure 27 - View of SB8 – note low stone walling in foreground

Figure 28 - Entrance at SB8, with small raised stone platform on the left side of the walling

- **Site SB9** (GPS Coordinates: E27.57579, S26.36513)

The site is currently utilised as the farm labourers' homesteads and consists of corrugated iron houses, a large shed and some prefabricated structures, all utilised as housing.

Site Significance: The site has no heritage significance and no mitigation is necessary.

Figure 29 - New prefabricated houses at SB9

Figure 30 - Small homesteads at SB9

8.4.2 Heritage Sites Identified within the Alternative Site 2

The initial screening survey of Site 2 and subsequent fieldwork, which focused on the northern area of Site 2, did not identify any heritage sites within the Alternative Site 2. Most of this site is covered by maize fields.

Figure 31 – View of alternative Site 2, showing maize field

Figure 32 – View of alternative Site 2, showing grassland

8.4.3 Heritage Sites Identified within the Alternative Site 3

The initial screening survey of Site 3 identified two main heritage sites in the flat area of this site (a historical farmstead complex and an informal cemetery), as well as the possibility of the ridge to the south being an area of heritage sensitivity for Stone Age and Iron Age archaeological sites. This initial assessment of heritage factors contributed to the exclusion of the site as a preferred alternative in the site selection process. Therefore, Site 3 was not assessed at a detailed fieldwork level.

Figure 33 - View of historic farmstead

Figure 34 – Remains of structure, historic farmstead

Figure 35 – Old silo & associated building

Figure 36 – View of historic graveyard

Figure 37 – View of historic graveyard

8.4.4 Palaeontological resources

Even though a geotechnical report commissioned by Sibanye Gold did not record significant bedrock exposure or areas of existing and potential sinkhole formation, it is important to note that well-defined small scale stromatolites, as well as some potential cave breccias, were recorded during the palaeontological field survey.

Field observations confirmed that, due to deep weathering, the likelihood of finding significant remains of plant fossils in the Ecca Group rocks is low.

Palaeontological Resources identified within the two alternatives Site 1 and Site 2

The initial screening survey of Site 1 and Site 2 and subsequent fieldwork, which focused on Site 1 and the northern area of Site 2, revealed the same results for both sites and the recommendations for sensitivity and mitigation are the same. Alternatives Site 1 and Site 2 are mostly underlain by ploughed fields and single dolomite boulders with well-defined small stromatolite as were recorded during the field survey. If significant exposures of dolomite with stromatolites are exposed during pre-construction or construction activities, the presence of these structures must be reported by the ECO and a representative sample of 1m^3 should be collected by a qualified palaeontologist.

Single chert breccia boulders were also recorded during the field investigation. If significant exposure of cave breccias occurs during pre-construction or construction activities, these areas will have to be regarded as of Very High Palaeontological significance and probably be declared as “no-go” zones.

Following the site investigation and the observation that no outcrops of significant dolomite are present, the palaeontological significance must be regarded as *moderate-negative*, except if significant bedrock exposure of stromatolitic dolomite results from pre-construction or construction activities.

Mitigation:

- Should any sinkhole structures be identified, the Palaeontologist should be informed.
- If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccia are recorded, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer be appointed to do a Phase 2 PIA investigation with:
    - 1. Recording and collection of stromatolite information
    - 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.

The above mitigation can only be conducted after a mitigation permit has been issued by SAHRA under section 34 and 35 of the NHRA. Upon completion of the documentation, the developer can apply for a destruction permit for significant stromatolites with the backing of the documentation report. Any

exposure of cave breccias will have a very high Palaeontological Sensitivity and must be recorded and excluded from destruction for further investigation by a qualified palaeontologist, following the procedures prescribed by SAHRA.

Due to the fact that alternative Site 3 was excluded at the initial stages of the investigation, the site was not investigated during the fieldwork.

9 DESCRIPTION OF ALTERNATIVES

Sibanye Gold plans to develop the 200 MW PV facility in phases of 50 MW, with the initial phase of 50 MW anticipated to be operational by the end of 2017. Generally a 200 MW PV facility would require a footprint area of approximately 600 ha (based on a calculation of 3 ha per MW). This ratio was considered during the site selection process to allow for contingencies, although estimates as low as 2 ha per MW have been suggested.

Sibanye Gold identified three sites for the proposed facility based on the following main criteria:

- Land availability and ownership;
- Size of the land; and
- Distance to existing substations, in particular the Libanon, Midas and East Drie Gold Substations.

Based on the above, the three sites proposed for the PV facility vary in size and are located on various portions of land.

Table 4 - Details of the three proposed sites

Site	Property details	Size
Site 1 - blue area in **Figure 39**	Located on Farm Uitval 280 (portions 1, 2, 4, 5, and 6) immediately north of road R501.	approximately 851 ha
Site 2 - yellow area in **Figure 39**	Farm Uitval 280 (portions 8, 9, 10 and 11) immediately south of the R501.	approximately 775 ha
Site 3 - red area in **Figure 39**	Farm Leeuwpoort 356 (portions 70 and 71), and Farm Doornkloof 350 (portion 5) located to the north of the N12.	approximately 622 ha

9.1 Project Site Selection Process

Aurecon's site selection report (Aurecon, 2015) used a MCDM (Multi- Criteria Decision-Making) model to assess the best site for the proposed project. This model evaluated the three different site alternatives against a set of main criteria (technical, biophysical and social environment) and then rated them

according to different impacts (fatal flaw, high impact, moderate impact, low impact and insignificant impact).

When combining all of the criteria, there was a clear preference for Site 1 (77.10%) over Site 2 (60.60%) and Site 3 (57.16%) as indicated in **Figure 38** below. This follows the trend for all three criteria, except for the technical criterion for Sites 2 and 3. Although Site 3 is technically preferred to Site 2, Site 2 is preferred over Site 3 based on a stronger score for biophysical and social criteria.

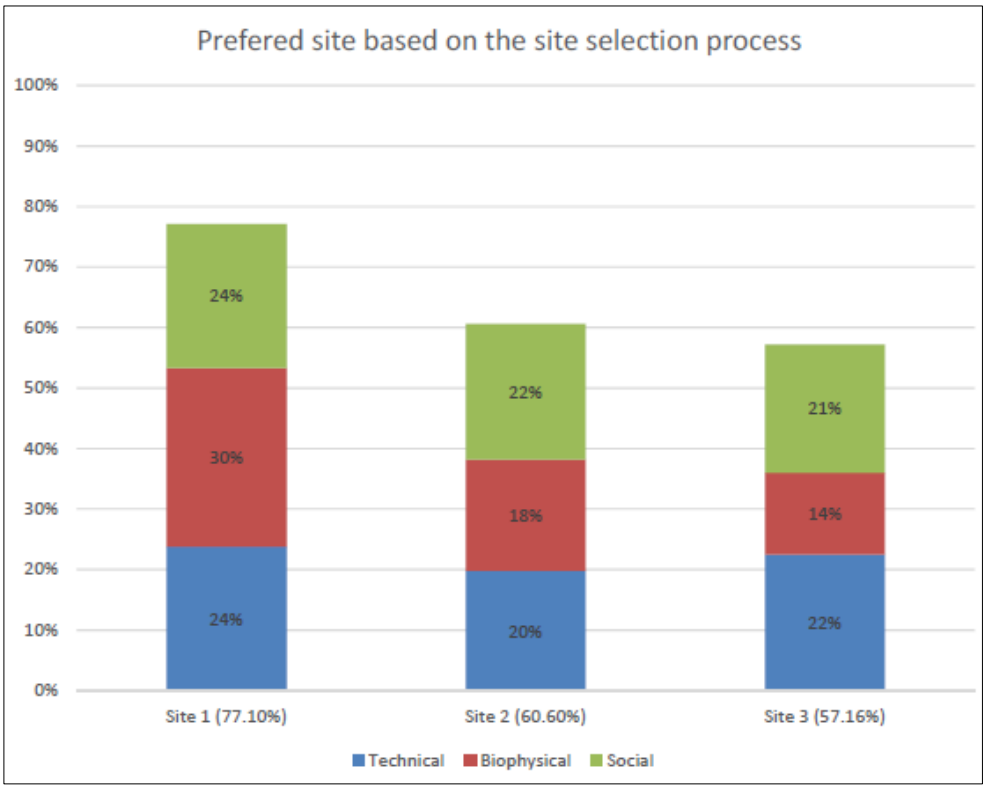


Figure 38 - Overall preference of the sites

9.2 Selected Site

Due to the preferred rating of Site 1 followed by Site 2, it was recommended that both Site 1 and Site 2 be assessed in the EIA study.

Table 5 - Extent of sites and remaining constructible area

Site	Extent (pre site selection process) (ha)	Remaining constructible areas (ha)
1	850.79	776.45
2	775.29	449.54
3	622.45	272.79

In addition, **Figure 39** indicates the remaining available areas considering all the sensitive features, servitudes, sensitive area buffers and road reserves for possible future roads.

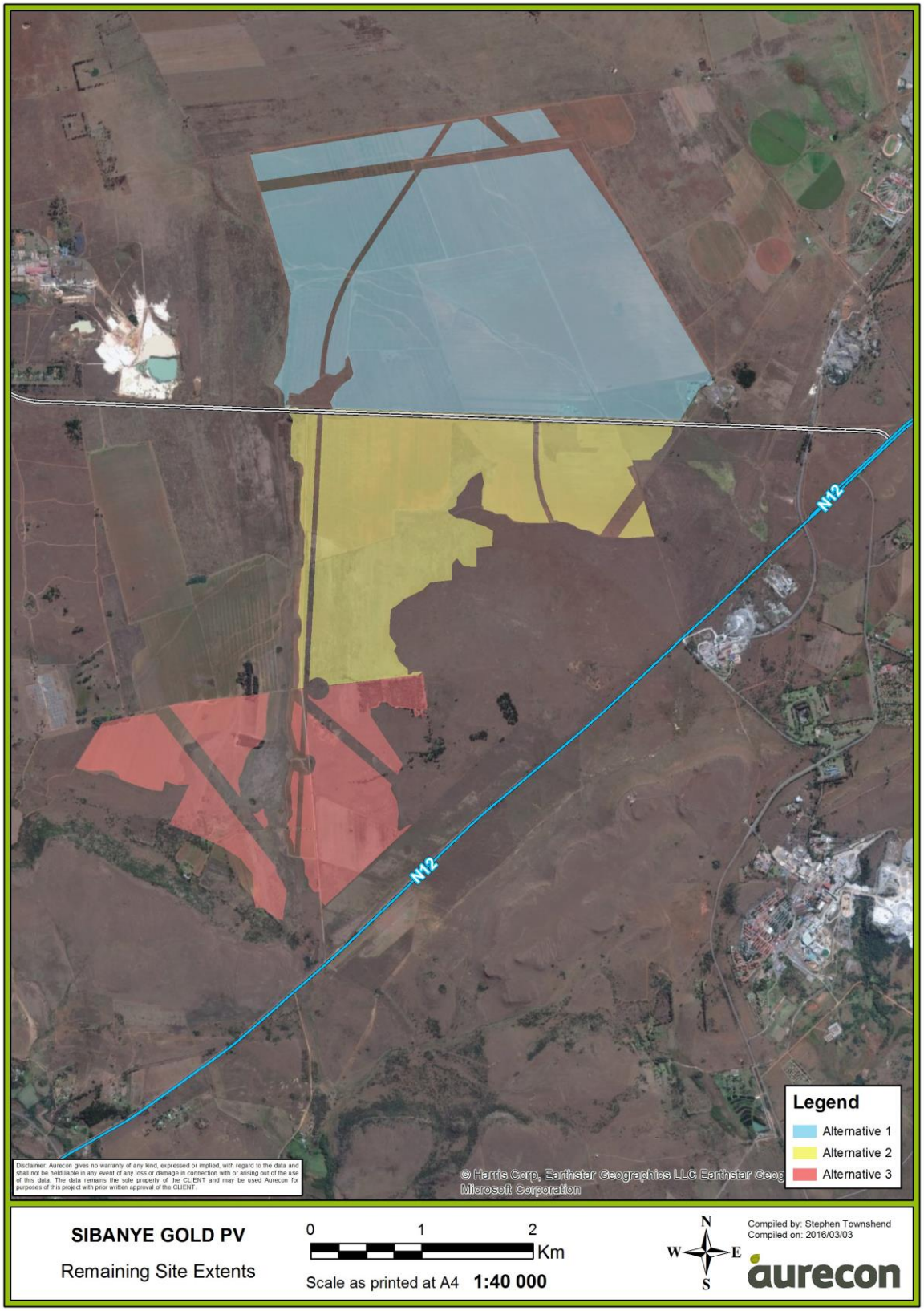


Figure 39 - Remaining available site area taking into account the services, infrastructure, sensitive features and buffers for the three alternative sites

From the perspective of heritage resources, and based on the initial site visit undertaken at a screening level (i.e. not a detailed ground-truthing), two definite heritage sites were identified on Site 3: an African cemetery containing approximately 30 graves and a historic farmstead with 15-20 buildings (see **Section 8.4.3**). In addition, based on sites identified by previous impact assessment studies in the general area, there is a high possibility of Iron Age settlement remains being located on the ridge to in the southern part of Site 3. From the initial screening visit, no obvious heritage sites were located on Site 2 or Site 1, since large areas of both sites are under cultivation and had been ploughed at the time of the initial site visit.

Based on the initial screening level assessment, followed by the results of the field survey, from a heritage perspective alternative Site 3 is the least preferred and either alternative Site 2 or alternative Site 1 would be the most preferred site.

10 IMPACT ASSESSMENT (INCLUDE ALTERNATIVES UNLESS SPECIFIC PROCESS FOLLOWED TO SCREEN OUT ALTERNATIVES)

As discussed in **Section 9.1** above, a multi-criteria decision-making process resulted in a clear preference for Site 1, followed by Site 2. Therefore, it was recommended that both Site 1 and Site 2 be assessed in the EIA study. For this reason, and because Site 1 has the largest available unfragmented area and fewer constraints than the other sites, the concept design report (Arup, 2015) made use of Site 1 for the concept design study.

10.1 Predicted impacts of the proposed development

The construction phase of the PV facility development will entail excavations into the superficial sediment cover (soils, alluvial gravels etc.) and locally also into the underlying bedrock. These excavations notably include site clearance activities and excavations for the solar panel foundations, buried cables, new internal access roads, transmission line pylon footings, on-site and central substations, stormwater infrastructure, and foundations for various buildings such as connection and control buildings. *If these activities will entail the disturbance of subsoil and rock deeper than 1.5 m, it may adversely affect fossil remains within the study area by destroying, disturbing or permanently sealing-in fossils at or below the ground surface that are then no longer available for scientific research or other public good.* However, once constructed, the operational and decommissioning phases of the PV facility will not involve potential further adverse impacts on archaeological or historical heritage.

In general, the destruction, damage or disturbance out of context of archaeological or historical sites or fossils that may occur during construction represents a negative impact. Negative impacts on archaeological or historical heritage resources can usually be mitigated, but cannot be fully rectified or reversed; i.e. they are permanent in duration and irreversible. Potential impacts are confined to the development footprint i.e. very limited in extent. The palaeontological sensitivity of the bedrocks and

superficial sediments in all the PV sites vary from high to very-high heritage significance (Section **8.4.4**) and the calculated impact intensity pre-mitigation is rated as *moderate negative*.

According to the Aurecon system for ranking of impacts, the consequence of impacts on archaeological and historical heritage in all the alternative PV study areas are assessed before mitigation as slightly detrimental (-) and their significance as *negligible – negative* (-), as summarised in the separate table for each development component presented below (**Table 6** to **Table 10**).

With mitigation, as outlined below in proposals for the Environmental Management Programme (EMPr), any residual negative impacts from loss of archaeological or historic resources during construction would be partially or fully offset by an improved heritage and palaeontological database for the study region as a direct result of appropriate mitigation. This is a positive outcome because any new, well-recorded and suitably curated fossil material from this palaeontologically under-recorded region would constitute a useful addition to our scientific understanding of the fossil heritage here.

Should mitigation of rare but valuable chance fossil finds (e.g. well-preserved vertebrate remains) be followed through, the consequence – in terms of improved understanding of the fossil heritage of southern Africa - is rated as highly beneficial (+) and the impact significance of the development is rated as minor-positive (+).

10.1.1 PV Alternative Site 1

As summarised in the tables below, the significance of anticipated impacts on archaeological and historical heritage associated with the construction phase of the proposed PV development of Alternative Site 1 are assessed as *negligible-negative* before mitigation. With mitigation of the identified resources, the impact significance improves to *minor-positive*. The operational and decommissioning phases of the solar plant should not involve further adverse impacts on archaeological, historical heritage and palaeontological resources.

Historic/recent Structures

Table 6 indicates the assessment of impacts to historical structures for the proposed PV facility if it is located on the preferred alternative Site 1. Historical structures were identified at **SB3-SB8**. Impacts would occur during the construction phase only. The negative impacts are rated as being of moderate significance but, if the important sites cannot be avoided, they could be easily mitigated through excavation and collection of the material to result in the impact significance being reduced to negligible.

Table 6 - Assessment of impacts to the historic structures for PV alternative Site 1

IMPACT DESCRIPTION: Destruction of historic structures				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Impacts to historic structures cannot be reversed.	Consequence: Moderately detrimental (-13)	Significance: Minor - negative (-39)
Extent	Local (3)	The significance of the resources is medium which means impacts would not be felt beyond the local area.		
Intensity x type of impact	Moderate - negative (-3)	The medium significance suggests moderately intensity impacts. They are negative because resources would be destroyed.		
Probability	Unlikely (3)	The historical structures are located close to the Option 1 transmission line alignment on Alternative Site 1 but may not be affected.		
MITIGATION: If the sites are to be affected by the proposed development, the structures will have to be documented through mapping and excavations to determine the layout and history of the site. A mitigation permit is required from SAHRA (section 34 and 35 of the NHRA). Further archival research into the existence of the school will also be required to provide historical background information. A destruction permit is required from SAHRA (section 34 and 35 of the NHRA).				
POST-MITIGATION				
Duration	Short term (2)	After mitigation, the structures can be demolished.	Consequence: Negligible (4)	Significance: Negligible - positive (4)
Extent	Very limited (1)	Impacts to historic structures will be limited to the structures.		
Intensity x type of impact	Very low - positive (1)	The mitigation of the structures will preserve a record of the structures.		
Probability	Highly unlikely (1)	With mitigation, there should be no further impacts.		
BROADER CONSIDERATIONS				
Confidence	High	Based on several field-based impact assessments		
Reversibility	Irreversible	Once impacts to historical structures have occurred, they cannot be reversed.		
Irreplaceability	Irreplaceable	Once historical structures have been destroyed, they cannot be replaced.		

Possible graves

Table 7 shows the assessment of impacts that might occur to the two features identified as possible graves in the PV alternative Site 1 development area. Although graves are very important in terms of heritage and impacts would certainly occur if the development proceeded, there is a relatively low likelihood of the features actually being graves (probability is rated as 'unlikely'). As a result, the calculated significance of negative impacts before mitigation is minor. With mitigation, the impacts would be reduced to negligible.

In order to avoid unnecessary disturbance of heritage resources, any subsurface interventions, whether test excavation or mitigation, should only be undertaken once the project has been authorised and is being prepared for implementation.

Table 7 - Assessment of impacts to the possible graves for PV alternative Site 1

IMPACT DESCRIPTION: Destruction of graves				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Impacts to graves cannot be reversed.	Consequence: Highly detrimental (-14)	Significance: Minor - negative (-42)
Extent	Limited (2)	Restricted to the possible graves		
Intensity x type of impact	High - negative (-5)	Because graves are important, the intensity of impact is regarded as high.		
Probability	Unlikely (3)	The two possible graves are located close to the Option 1 transmission line alignment on Alternative site 1 but may not be affected.		
MITIGATION:				
If the site will be affected by the proposed development, the two possible graves will need to be test excavated and if human remains are present, the graves will need to be removed. Permits are required from various authorities under the National Health Act (No 61 of 2003) and the NHRA.				
POST-MITIGATION				
Duration	Short term (2)	Once the grave is exhumed, there will be no further impact.	Consequence: Negligible (4)	Significance: Negligible - positive (4)
Extent	Very limited (1)	The impacts would be limited to the possible graves.		
Intensity x type of impact	Very low - positive (1)	Once the grave is exhumed, the skeleton would have been protected from further impacts such that the intensity of impacts could be reduced to low.		
Probability	Highly unlikely (1)	With mitigation, it is highly unlikely that further impacts would occur.		
BROADER CONSIDERATIONS				
Confidence	High	Based on several field-based impact assessments / Although there is uncertainty as to whether the cairns represent graves (as reflected by the probability rating), this is the most likely option.		
Reversibility	Irreversible	Damaged or destroyed graves cannot be reversed		
Irreplaceability	Irreplaceable	Damaged or destroyed graves cannot be replaced		

Recent structures

Table 8 indicates the assessment of impacts to recent structures for the proposed PV facility if this is located on the preferred alternative Site 1. Impacts would occur during the construction phase only. The negative impacts are rated as being of negligible-negative significance, without any mitigation being required.

Table 8 - Assessment of impacts to the recent structures for PV alternative Site 1

IMPACT DESCRIPTION: Destruction of recent structures				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Immediate (1)	Impacts to such structures have no serious consequences.	Consequence: Negligible (0)	Significance: 0 (0)
Extent	Very limited (1)	Impacts to such structures will be limited to the structures.		
Intensity x type of impact	Negligible (0)	Since such structures have no-low heritage significance the intensity is negligible.		
Probability	Unlikely (3)	The location of such structures makes any impact unlikely.		
MITIGATION: No mitigation is required in terms of the heritage legislation.				
POST-MITIGATION				
Duration	Immediate (1)	No mitigation is required.	Consequence: Negligible (0)	Significance: 0 (0)
Extent	Very limited (1)	Impacts to such structures will be limited to the structures		
Intensity x type of impact	Negligible (0)	Since such structures have no-low heritage significance the intensity is negligible.		
Probability	Improbable (2)	The location of such structures makes any impact unlikely.		
BROADER CONSIDERATIONS				
Confidence	High	Based on several field-based impact assessments		
Reversibility	Not applicable	Such structures have no-low heritage significance		
Irreplaceability	Not applicable	Such structures have no-low heritage significance		

Palaeontological resources

Table 9 indicates the assessment of impacts to palaeontological resources for the proposed PV facility if it is located on the preferred alternative Site 1. Impacts would occur during the construction phase only. The negative impacts are rated as being of *moderate* significance, but if the important sites cannot be avoided, they could be easily mitigated through excavation and collection of the material to result in the impact significance being reduced to *minor-positive*.

Table 9 - Assessment of impacts to the palaeontological resources for PV alternative Site 1

IMPACT DESCRIPTION: Destruction of fossils				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Fossils that are lost cannot be recovered	Consequence: Extremely detrimental (-16)	Significance: Moderate - negative (-80)
Extent	Local (3)	The development area is limited and may not affect significant bedrock		
Intensity x type of impact	High - negative (-5)	Loss of Homonin fossils will result in serious loss of scientific information		
Probability	Likely (5)	If sink holes and cave breccias are exposed, the probability of finding significant fossils is likely		
MITIGATION: If excavation for foundations will exceed 1.5m or if sinkholes, stromatolite structures or cave breccia is identified, the palaeontologist must be informed. Any presence of bone material must be reported as soon as it is discovered and the site must be closed for further excavation until such time that the palaeontologist has an opportunity to investigate the remains and declare the site safe for further excavation. All potential sink holes must be mapped out and where cave breccias are present, the material must be inspected for remains of Quaternary aged organisms.				
POST-MITIGATION				
Duration	Permanent (7)	Fossils that are recovered will add unlimited knowledge to the understanding of the past	Consequence: Highly beneficial (13)	Significance: Minor - positive (52)
Extent	Local (3)	The development area is limited and may not affect significant bedrock		
Intensity x type of impact	Moderate - positive (3)	Recovery of significant stromatolites and fossils of Homonin remains will add significantly to our knowledge of the past		
Probability	Probable (4)	Finding of fossils where cave breccia and/or significant stromatolites are exposed in excavations of deeper than 1.5m is probable		
BROADER CONSIDERATIONS				
Confidence	Medium	Without excavation to 1.5m, it is not possible to estimate the chances of finding significant fossils on site		
Reversibility	Irreversible	Fossils that are destroyed cannot be recovered		
Irreplaceability	Irreplaceable	Fossils that are destroyed cannot be recovered		

10.1.2 PV Alternative Site 2

No significant heritage resources were identified on Site 2, except for palaeontological resources. The palaeontological resources could be adversely affected during the construction phase of the proposed development. The operational and decommissioning phases of the proposed development should not involve further adverse impacts on archaeological and historical or palaeontological heritage.

Historical Structures

Although most of Site 2 was surveyed only at a screening level, with the detailed fieldwork focused on the northern area immediately adjacent to Site 1, the current use of the ground for crop agriculture is

highly likely to preclude the presence of any historical structures. Hence, no impact is expected and no impact assessment table has been compiled for Site 2 with respect to historical structures.

Graves

Although graves are very important in terms of heritage, no graves or possible graves were identified in the survey of PV alternative Site 2. Hence, no impact is expected and no impact assessment table has been compiled for Site 2 with respect to graves.

Recent Structures

No recent structures were identified on alternative Site 2. Hence, no impact is expected and no impact assessment table has been compiled for Site 2 with respect to graves.

Palaeontological resources

Table 10 indicates the assessment of impacts to palaeontological resources for the proposed PV facility if it is located on the alternative Site 2. The impacts would be the same as for Site 1, since the underlying geology is the same. Impacts would occur during the construction phase only. The negative impacts are rated as being of *moderate* significance, but if the important sites cannot be avoided, they could be easily mitigated through excavation and collection of the material to result in the impact significance being reduced to *minor-positive*.

Table 10 - Assessment of impacts to the palaeontological resources for PV alternative Site 2

IMPACT DESCRIPTION: Destruction of fossils				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Fossils that are lost cannot be recovered	Consequence: Extremely detrimental (-16)	Significance: Moderate - negative (-80)
Extent	Local (3)	The development area is limited and may not affect significant bedrock		
Intensity x type of impact	High - negative (-5)	Loss of Homonin fossils will result in serious loss of scientific information		
Probability	Likely (5)	If sink holes and cave breccias are exposed, the probability of finding significant fossils is likely		
MITIGATION: Where excavation for foundations will exceed 1.5m, or if sinkholes, stromatolite structures or cave breccia is identified, the palaeontologist must be informed. Any presence of bone material must be reported as soon as it is discovered and the site must be closed for further excavation until such time that the palaeontologist had an opportunity to investigate the remains and declare the site safe for further excavation. All potential sink holes must be mapped out and where cave breccia is present, the material must be inspected for remains of Quaternary aged organisms.				
POST-MITIGATION				
Duration	Permanent (7)	Fossils that are recovered will add unlimited knowledge to the understanding of the past	Consequence: Highly beneficial (13)	Significance: Minor - positive (52)
Extent	Local (3)	The development area is limited and may not affect significant bedrock		
Intensity x type of impact	Moderate - positive (3)	Recovery of significant stromatolites and fossils of Homonin remains will add significantly to our knowledge of the past		
Probability	Probable (4)	Finding of fossils where cave breccia and/or significant stromatolites are exposed in excavations of deeper than 1.5 m is probable		
BROADER CONSIDERATIONS				
Confidence	Medium	Without excavation to 1.5 m it is not possible to estimate the chances of finding significant fossils on site		
Reversibility	Irreversible	Fossils that are destroyed cannot be recovered		
Irreplaceability	Irreplaceable	Fossils that are destroyed cannot be recovered		

10.1.3 PV Alternative Site 3

PV alternative Site 3 has not been evaluated as it was excluded from further study during the site selection phase.

10.1.4 No-Go Alternative for the PV facility

The No-Go alternative will have no impact on heritage resources and the current status quo will be kept.

10.2 Mitigation measures

10.2.1 PV Alternative Site 1

Various heritage sites that will require mitigation were identified on PV Alternative Site 1. These included historical structures (**SB3-SB8**), a possible grave site (**SB6**) and palaeontological resources. Several recent structures (**SB1**, **SB2** and **SB9**) were also identified, which would not require mitigation. **Table 11** summarises the mitigation measures required.

Table 11 – Mitigation measures for PV Alternative Site 1

Site	Mitigation Measure	Legal Requirement
Historical Structures Site SB3 – SB8	If the sites are to be affected by the proposed development, the structures will have to be documented through mapping and excavations to determine the layout and history of the site.	A mitigation permit is required from SAHRA (section 34 and 35 of the NHRA).
Possible grave Site SB6	If the site will be affected by the proposed development, the two possible graves will need to be removed.	Permits to exhume the possible graves are required from various authorities under the National Health Act (No 61 of 2003) and the NHRA
Palaeontology	• If sinkhole structures are found, the Palaeontologist must be informed. • If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccias are exposed, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with: • 1. Recording and collection of stromatolite information • 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.	A mitigation and destruction permit is required from SAHRA (section 35 of the NHRA).
	• All areas where significant bedrock might be exposed (> 1.5 m bedrock excavations) should be monitored for fossil remains by the Environmental Control Officer (ECO). Should substantial fossil remains, such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be	

	exposed during construction, the responsible ECO should safeguard these, preferably *in situ*, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, and taphonomy) by a professional palaeontologist. • A finds management protocol needs to be developed for construction activities. • If no significant fossil finds (see glossary) are found, no further mitigation for palaeontological heritage is required.	

10.2.2 PV Alternative Site 2

No historical or archaeological heritage sites were identified on this site during the scoping or fieldwork phases. Mitigation measures for the palaeontological resources identified will be the same as for alternative Site 1 (see **Table 12**).

Table 12 – Mitigation measures for PV Alternative Site 2

Site	Mitigation Measure	Legal Requirement
Palaeontology	If sinkholes are found, the Palaeontologist must be informed. • If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccias are recorded, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with:	A mitigation and destruction permit is required from SAHRA (section 35 of the NHRA).

	•1. Recording and collection of stromatolite information 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.	
	All areas where significant bedrock might be exposed (> 1.5 m bedrock excavations) should be monitored for fossil remains by the Environmental Control Officer (ECO). Should substantial fossil remains, such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably in situ, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact	
	details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, and taphonomy) by a professional palaeontologist. • A finds management protocol needs to be developed for construction activities. • If no significant fossil finds (see glossary) are recorded, no further mitigation for palaeontological heritage is recommended.	

10.2.3 PV Alternative Site 3

Since PV Alternative Site 3 was excluded from further study during the site selection phase, it is assumed that the two heritage sites identified at the screening / scoping level phase (prior to exclusion) will not be affected by the proposed project.

10.2.4 Identify mitigation measures to enhance positive impacts.

Table 13 – PV Alternative Site 1

Site	Mitigation Measures	Legal Requirement
Historical Structures Site SB3 – SB8	Further archival research into the existence of the school will also be required to provide historical background information, should this site be affected and need to be removed. A documentation and historical background report will be produced.	A destruction permit is required from SAHRA (section 34 and 35 of the NHRA).
Possible Graves Site SB6	A grave relocation report will be produced as part of the mitigation measures.	
Palaeontology	If sinkhole structures are found, the Palaeontologist must be informed. The scientific recording and judicious sampling or collection of fossil material and associated geological data (e.g. stratigraphy, sedimentology, and taphonomy) by a professional palaeontologist will add to the academic understanding of the fossil heritage and our understanding of the palaeo-environments of this part of South Africa.	A mitigation and/or collections permit is required from SAHRA (section 35 of the NHRA).

PV Alternative Site 2

No historical or archaeological heritage sites were identified at the screening / scoping level phase or during the fieldwork. The mitigation measures for the palaeontological resources identified will be the same as for alternative Site 1 (see **Table 14**).

Table 14 – PV Alternative Site 2

Site	Mitigation Measures	Legal Requirement
Palaeontology	If sinkhole structures are found, the Palaeontologist must be informed. The scientific recording and judicious sampling or collection of fossil material and associated geological data (e.g. stratigraphy, sedimentology, and taphonomy) by a professional palaeontologist will add to the academic understanding of the fossil heritage and our understanding of the palaeo-environments of this part of South Africa.	A mitigation and/or collections permit is required from SAHRA (section 35 of the NHRA).

PV Alternative Site 3

The two heritage sites identified at the screening / scoping level phase will not be affected by the proposed project, since this site was excluded during the site selection phase. The palaeontological resources were not assessed during the fieldwork for this reason and are not expected to be affected.

10.2.5 Potential offset measures for impacts that cannot be mitigated to acceptable levels

Not applicable to heritage resources.

10.2.6 Potential negative impacts of mitigation measures proposed

Unless the sites are avoided, the mitigation measures proposed will result in the sites being totally destroyed.

10.2.7 Level of confidence that the mitigation measures will work and that they will be implemented

All mitigation measures proposed for all heritage sites which have been identified as significant and/or protected will be effective to minimise the impacts to acceptable levels. These measures of similar measures have been applied at numerous other developments. Therefore, there is a substantial base of experience for their effectiveness. Furthermore, these mitigation measures are required to comply with the National Heritage Resources Act (No 25 of 1999). Failure to comply could result in legal action, leading to prosecution.

10.2.8 Impact should mitigation measures fail

The identified heritage resources will be completely destroyed and are irreplaceable.

10.2.9 Residual impacts that will remain after mitigation and uncertainties to be addressed in the EMP

If the identified heritage resources will not be affected directly by construction activities for the proposed PV facility, then no residual impacts will remain after mitigation. In addition, in the case of mitigation involving the relocation of graves, the heritage resource will no longer exist after the mitigation measures have been implemented.

10.3 Assess cumulative impact of the proposal in terms of the current and proposed activities in the area

Table *15.* to **Table 19** shows the assessment of cumulative impacts to the identified heritage resources in the study area resulting from the development of the Sibanye PV facility together with the development of the associated transmission lines. This applies to the historical structures, possible graves, palaeontological resources and recent structures that were identified on the preferred alternatives Site 1 and Site 2. Since it is improbable to highly unlikely that the PV facility will be developed on the least preferred alternative of Site 3, the heritage resources identified on this site were not included in the cumulative impact assessment.

In addition, as indicated by the review of previous HIA reports available on the SAHRIS database, several other development projects have either already been constructed or are proposed for development in the near future. As a result of this, various identified heritage sites similar to those identified in this HIA report (graves, historical structures), as well as archaeological sites, are likely to be destroyed in the area. The mitigation proposed for both components of the present development (PV facility and transmission lines) will reduce the significance of the overall impact and it is calculated as moderate to minor. It was not clear from the previous HIA reports if palaeontological resources had been assessed or not.

Most of the previous HIA reports are associated with the surrounding mines (expansion of mining area, infrastructure such as tailings dams. etc.), such as East and West Driefontein, Libanon and Kloof. Mines and the development of the Geluksdal Tailings Facility and a transmission line connected to the existing Libanon substation.

Before mitigation, the cumulative impact assessment is calculated as moderate to low, the mitigation proposed for the present development will reduce the significance of the overall impact, but it is still calculated as low.

10.3.1 Assessment of Cumulative Impacts on Heritage Resources identified on PV alternative Site 1

Before mitigation, the cumulative impact assessment for the different types of heritage resources identified in the study area is calculated as low to moderate (-). In most cases, the mitigation proposed for the present development will reduce the significance of the overall impact to minor (+).

Table 15. Cumulative impacts to the historical structures identified on Site 1

IMPACT DESCRIPTION: Destruction of historic structures				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Impacts to historic structures cannot be reversed	Consequence: Moderately detrimental (-13)	Significance: Minor - negative (-39)
Extent	Local (3)	The significance of the resources is medium which means impacts would not be felt beyond the local area.		
Intensity x type of impact	Moderate - negative (-3)	The medium significance suggests moderate intensity impacts. They are negative because resources would be destroyed.		
Probability	Unlikely (3)	The historical structures are located on Alternative Site 1 but may not be affected by the PV footprint. The existing mines and other regional developments are likely to have affected other previously identified historical structures.		
MITIGATION: If the sites are to be affected by the proposed development, the structures will have to be documented through mapping to determine the layout and history of the site. A mitigation permit is required from SAHRA (section 34 and 35 of the NHRA). A destruction permit is required from SAHRA (section 34 and 35 of the NHRA).				
POST-MITIGATION				
Duration	Short term (2)	After mitigation, the structures can be demolished	Consequence: Negligible (4)	Significance: Negligible - positive (4)
Extent	Very limited (1)	Impacts to historic structures will be limited to the structures.		
Intensity x type of impact	Very low - positive (1)	The mitigation of the structures will preserve a record of the structures		
Probability	Highly unlikely (1)	With mitigation, there should be no further impacts.		
BROADER CONSIDERATIONS				
Confidence	High	Based on several field-based impact assessments.		
Reversibility	Irreversible	Once impacts to historical structures have occurred, they cannot be reversed.		
Irreplaceability	Irreplaceable	Once historical structures have been destroyed, they cannot be replaced.		

Table 16. Cumulative impacts to the grave sites identified on Site 1

IMPACT DESCRIPTION: Destruction of graves				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Impacts to graves cannot be reversed.	Consequence: Moderately detrimental (-13)	Significance: Minor - negative (-52)
Extent	Limited (2)	Restricted to the two possible graves		
Intensity x type of impact	Moderately high - negative (-4)	For graves, the intensity of impact is regarded as high. However, once a grave has been mitigated no further impact will apply.		
Probability	Probable (4)	With construction, impacts would probably occur. The existing mines and other regional developments are likely to have affected other previously identified grave sites.		
MITIGATION: Avoidance is always the best option, but in the event that this is not possible then mitigation in the form of test excavation and relocation of any human remains would need to take place prior to the start of construction.				
POST-MITIGATION				
Duration	Short term (2)	Once the possible graves are confirmed and exhumed, there will be no further impact.	Consequence: Negligible (5)	Significance: Negligible - positive (5)
Extent	Very limited (1)	The impacts would be limited to the two possible graves.		
Intensity x type of impact	Low - positive (2)	Once the grave is exhumed, the skeleton would have been protected from further impacts such that the intensity of impacts could be reduced to low.		
Probability	Highly unlikely (1)	With mitigation, it is highly unlikely that further impacts would occur.		
BROADER CONSIDERATIONS				
Confidence	High	Based on several field-based impact assessments		
Reversibility	Irreversible	Damaged or destroyed graves cannot be replaced		
Irreplaceability	Irreplaceable	Damaged or destroyed graves cannot be replaced		

Table 17. Assessment of cumulative impacts to the palaeontological resources identified on Site 1

IMPACT DESCRIPTION: Destruction of Fossils – Cumulative Impact				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Impacts to palaeontological resources are not reversible.	Consequence: Moderately detrimental (-12)	Significance: Minor - negative (-48)
Extent	Local (3)	Limited to Local Area		
Intensity x type of impact	Low - negative (-2)	Damage or destruction of fossils compromises valuable palaeontological heritage. Significant fossil remains in study area are very rare & development footprint is quite small.		
Probability	Probable (4)	With construction, impacts would probably occur. The existing mines and other regional developments are likely to have affected other previously identified .palaeontological resources		
MITIGATION: Where excavation for foundations will exceed 1.5m, or if sinkholes, stromatolite structures or cave breccia is identified, the palaeontologist must be informed. Any presence of bone material must be reported as soon as it is discovered and the site must be closed for further excavation until such time that the palaeontologist has an opportunity to investigate the remains and declare the site safe for further excavation. All potential sink holes must be mapped out and where cave breccias are present, the material must be inspected for remains of Quaternary aged organisms.				
POST-MITIGATION				
Duration	Immediate (1)	Damaged or destroyed palaeontological resources cannot be replaced.	Consequence: Moderately beneficial (11)	Significance: Minor - positive (44)
Extent	National (6)	Improved knowledge of palaeontology is a national good.		
Intensity x type of impact	Moderately high - positive (4)	Given their rarity, new fossil finds are of scientific importance and heritage value.		
Probability	Probable (4)	Finding of fossils where cave breccia and/or significant stromatolites are exposed in excavations of deeper than 1.5m is probable.		
BROADER CONSIDERATIONS				
Confidence	Medium	Without excavation to 1.5m it is not possible to estimate the chances of finding significant fossils on site		
Reversibility	Irreversible	Damaged or destroyed fossils cannot be replaced.		
Irreplaceability	Irreplaceable	Damaged or destroyed fossils cannot be replaced.		

Table 18. Assessment of cumulative impacts to the recent structures identified on Site 1

IMPACT DESCRIPTION: Destruction of Recent Structures – Cumulative Impacts				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Immediate (1)	Impacts to such structures have no serious consequences.	Consequence: Negligible (0)	Significance: 0 (0)
Extent	Very limited (1)	Impacts to such structures will be limited to the structures.		
Intensity x type of impact	Negligible (0)	Since such structures have no-low heritage significance the intensity is negligible.		
Probability	Unlikely (3)	With construction, impacts may occur. The existing mines and other regional developments are likely to have affected other previously identified recent structures		
MITIGATION: No mitigation is required in terms of the heritage legislation.				
POST-MITIGATION				
Duration	Immediate (1)	No mitigation is required.	Consequence: Negligible (0)	Significance: 0 (0)
Extent	Very limited (1)	Impacts to such structures will be limited to the structures.		
Intensity x type of impact	Negligible (0)	Since such structures have no-low heritage significance the intensity is negligible.		
Probability	Improbable (2)	The location of such structures makes any impact unlikely.		
BROADER CONSIDERATIONS				
Confidence	High	Based on several field-based impact assessments		
Reversibility	Not applicable	Such structures have negligible heritage significance		
Irreplaceability	Not applicable	Such structures have negligible heritage significance		

10.3.2 Assessment of Cumulative Impacts on Heritage Resources identified on PV alternative Site 2

Since the only heritage resources to be affected on PV alternative Site 2 are palaeontological resources, before mitigation, the cumulative impact assessment is calculated as moderate (-). The mitigation proposed for the present development will reduce the significance of the overall impact, to minor positive.

Table 19. Assessment of cumulative impacts to the palaeontological resources identified on Site 2

IMPACT DESCRIPTION: Destruction of Fossils – Cumulative Impact				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Impacts to palaeontological resources are not reversible.	Consequence: Moderately detrimental (-12)	Significance: Minor - negative (-48)
Extent	Local (3)	Limited to Local Area		
Intensity x type of impact	Low - negative (-2)	Damage or destruction of fossils compromises valuable palaeontological heritage. Significant fossil remains in study area are very rare & development footprint is quite small.		
Probability	Probable (4)	With construction, impacts would probably occur. The existing mines and other regional developments are likely to have affected other previously identified .palaeontological resources		
MITIGATION: Where excavation for foundations will exceed 1.5m, or if sinkholes, stromatolite structures or cave breccia is identified, the palaeontologist must be informed. Any presence of bone material must be reported as soon as it is discovered and the site must be closed for further excavation until such time that the palaeontologist had an opportunity to investigate the remains and declare the site safe for further excavation. All potential sink holes must be mapped out and where cave breccias are present, the material must be inspected for remains of Quaternary aged organisms.				
POST-MITIGATION				
Duration	Immediate (1)	Damaged or destroyed palaeontological resources cannot be replaced.	Consequence: Moderately beneficial (11)	Significance: Minor - positive (44)
Extent	National (6)	Improved knowledge of palaeontology is a national good.		
Intensity x type of impact	Moderately high - positive (4)	Given their rarity, new fossil finds are of scientific importance and heritage value.		
Probability	Probable (4)	Finding of fossils where cave breccia and/or significant stromatolites are exposed in excavations of deeper than 1.5m is probable.		
BROADER CONSIDERATIONS				
Confidence	Medium	Without excavation to 1.5m it is not possible to estimate the chances of finding significant fossils on site		
Reversibility	Irreversible	Damaged or destroyed fossils cannot be replaced.		
Irreplaceability	Irreplaceable	Damaged or destroyed fossils cannot be replaced.		

10.3.3 Assessment of Cumulative Impacts on Heritage Resources identified on PV alternative Site 3

PV alternative Site 3 has not been evaluated as it was excluded from further study during the site selection phase.

11 ENVIRONMENTAL MANAGEMENT PROGRAMME

In this section all the measures that will need to be implemented in order to reduce or eliminate impacts to heritage resources are outlined. These will need to be included within the EMPRs compiled for the various proposed developments. Sections **11.1** to **11.3** list all those measures that apply to the three alternative PV sites. It should be noted that at this stage, the preferred alternative for the PV facility is Site 1 and this assumption determines EMPr recommendations. Section **11.4** presents general best practice requirements that should be applied to the final preferred and authorised PV site and transmission line alignments. All of the measures identified are to be included in the construction EMPr. Where any requirements relate to other phases of the project this is specifically noted. Monitoring requirements are noted in Section **11.5** and apply equally to all of the proposed developments.

11.1 Environmental Management Programme PV Preferred Alternative Site 1

HERITAGE RESOURCES	MITIGATION MEASURES	LEGAL REQUIREMENTS
Historical structures: Site SB3 – SB8	1. If the sites are to be affected by the proposed development, the structures will have to be documented through mapping and excavations to determine the layout and history of the site. 2. Further archival research into the existence of the school will also be required to provide historical background information.	A mitigation permit and destruction will be required from SAHRA (section 34 and 35 of the NHRA).
Possible Graves: Site SB6	If the site will be affected by the proposed development, the two possible graves will need to be removed. This will include a social consultation process to identify any next-of-kin.	Permits to exhume the possible graves are required from various authorities under the National Health Act (No. 61 of 2003) and the NHRA.

Palaeontology	• If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccias are recorded, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with: • 1. Recording and collection of stromatolite information • 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time. •All areas where significant bedrock might be exposed (> 1.5 m bedrock excavations) should be monitored for fossil remains by the responsible Environmental Control Officer (ECO). Should substantial fossil remains, such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably in situ, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za).	A mitigation permit is required from SAHRA (section 35 of the NHRA).
	Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology and taphonomy) by a professional palaeontologist.	

11.2 Environmental Management Programme PV Preferred Alternative Site 2

Since no other heritage resources were identified on alternative Site 2, apart from palaeontology, this is the only aspect that should be included in the Environmental Management Programme for earthwork activities or construction work on Site 2.

HERITAGE RESOURCES	MITIGATION MEASURES	LEGAL REQUIREMENTS
Palaeontology	•If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccias are found, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with: • 1. Recording and collection of stromatolite information • 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.	A mitigation permit is required from SAHRA (section 35 of the NHRA).
Palaeontology	•All areas identified in the Geotechnical reports where significant bedrock might be exposed (> 1.5 m bedrock excavations) should be monitored for fossil remains by the responsible Environmental Control Officer (ECO). Should substantial fossil remains, such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably in situ, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology and taphonomy) by a professional palaeontologist	

11.3 Environmental Management Programme PV Alternative Site 3

None required, since this site was excluded at the initial stages of the process.

11.4 General best practice measures applicable to all developments

- Areas considered to be off-limits for construction should be clearly demarcated prior to site establishment and fenced if they will be close to areas of active construction.
- Construction vehicles should not be allowed outside of demarcated construction areas so as to protect other heritage resources that lie outside of the proposed layout areas. Similarly, once the facility is constructed, no vehicles should be permitted to drive outside of the fenced areas.
- If any laydown areas are required during the construction phase outside of the proposed development footprints or if any changes to the layout are required then the relevant areas need to be carefully planned to avoid all the sensitive heritage resources as identified in **Appendix A**. If any of these resources will be affected, then appropriate mitigation would be required before the area can be utilised.
- The two possible graves located on Site 1, and the informal graveyard located on Site 3, are to be treated as highly sensitive and to be avoided at all times. Any mitigation measures to be implemented must be undertaken by the relevant heritage specialist.

11.5 Monitoring requirements

During the construction phase, the environmental control officer (ECO) should ensure that no disturbance of the ground surface takes place outside of the demarcated development footprints. If any changes are required or laydown areas are planned, then the ECO should ensure that these areas are free from heritage and/or palaeontological mitigation requirements. This is best done by contacting the relevant heritage specialist and requesting a letter confirming the status of the areas planned for disturbance. If any sensitive resources are to be disturbed, then mitigation as outlined in this report will need to be effected.

No.	Mitigation Measures	Phase	Timeframe	Responsible Party For Implementation	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)	Cost
A	Include section on possible heritage finds in induction prior to construction activities take place.	Planning / Pre-Construction	Prior to construction	Applicant ECO Heritage Specialist	ECO (Monthly)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	No legal directives Legal compliance audit scores (Legal register) (ECO Monthly Checklist/Report)	**R5 000**
B	Implement chance find procedures in cases where possible heritage finds area made	Construction	During construction	Applicant ECO Heritage Specialist	ECO (weekly)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35and 38 of NHRA	ECO Monthly Checklist/Report	**Possibly R10 000**
C	Develop finds protocol for palaeontological resources	Pre-Construction	Pre-Construction	Applicant ECO Palaeontologist	Once off	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 and 38 of NHRA	Completion and development of mitigation measures	**R30 000**
D	Monitoring of construction activities by palaeontologist where excavations are deeper than 1.5 meters	Construction	During construction	Applicant ECO Palaeontologist	Palaeontologist (during excavations where needed)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 and 38 of NHRA	Palaeontologist Monthly Checklist/Report	**Monthly R40-50 000**

E	Implement mitigation for identified sites	Pre-construction	Pre-Construction	Applicant ECO Archaeologist Palaeontologist	Once off	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 and 38 of NHRA	Completion of mitigation measures and obtain destruction permit	**Approximately R300 000**

12 RECOMMENDATIONS

There are no objections on general archaeological or palaeontological heritage grounds to any of the alternative sites for the proposed PV facility. However, as set out above, Site 3 has been identified as the least preferred alternative site based on identified heritage resources and other criteria.

No sites or areas of high archaeological-historical or palaeontological sensitivity or no-go areas have been identified within the study area for each project component.

12.1 Recommendations PV Preferred Alternative Site 1

It is recommended that the proposed PV facility can be developed on Site 1, subject to the following conditions:

- Historical Structures
  If they cannot be avoided with at least a 20 m buffer, the significant historical structures identified (**SB3-SB8**) must be mitigated well in advance of construction.
- Possible Graves
  Prior to construction, the two possible graves (**SB6**) should be tested to see whether they are graves or not. If they are then they will require in situ preservation and avoidance as per SAHRA requirements. A buffer of 20 m is suggested if avoidance and protection occurs.
- Palaeontology
  - If sinkhole structures are identified, the Palaeontologist be informed.
  - If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccia are found, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with:
    - 1. Recording and collection of stromatolite information
    - 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.
  - During the construction phase, all deep (> 1.5 m) bedrock excavations should be monitored for fossil remains by the responsible Environmental Control Officer (ECO). Should substantial fossil remains such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably *in situ*, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology and taphonomy) by a professional palaeontologist.

- A finds management protocol needs to be developed for construction activities.
- If no significant fossil finds (see glossary) are recorded, no further mitigation for palaeontological heritage is recommended.

12.2 Recommendations PV Preferred Alternative Site 2

It is recommended that the proposed PV facility can be developed on Site 2 or a portion thereof subject to the following conditions:

- Palaeontology
  - If sinkhole structures are found, the Palaeontologist must be informed.
  - If significant fossil remains of stromatolites and/or significant remains of fossils in cave breccia are found, the HIA team and SAHRA must be informed of such finds and a suitably qualified palaeontologist must, at the cost of the developer, be appointed to do a Phase 2 PIA investigation with:
    - 1. Recording and collection of stromatolite information
    - 2. Recording and possibly arranging for intensive inspection of cave breccia deposits over an extensive period of time.
  - During the construction phase, all deep (> 1.5 m) bedrock excavations should be monitored for fossil remains by the responsible Environmental Control Officer (ECO). Should substantial fossil remains such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible ECO should safeguard these, preferably *in situ*, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense (SAHRA contact details: Manager - APM Unit, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: phine@sahra.org.za). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology and taphonomy) by a professional palaeontologist.
  - A finds management protocol needs to be developed for construction activities.
  - If no significant fossil finds (see glossary) are recorded, no further mitigation for palaeontological heritage is required.

13 CONCLUSIONS

This HIA has identified that several types of historical and palaeontological resources may be affected by the proposed development. A number of these heritage resources will require further intervention prior to the commencement of construction, but there are no fatal flaws to the proposed development of the PV facility and transmission routes proceeding. None of these heritage resources are of exceptionally high significance, although the possible graves and the informal graveyard are of high significance and will need to be mitigated, should they be affected.

Even if sites of palaeontological significance are found, there is very little danger of a fatal flaw that cannot be successfully mitigated. None of the presently observed palaeontological resources are of exceptionally high significance, although if cave breccia sites or stromatolites are uncovered, they might need some mitigation measures. Thismitigation will reduce the significance of impacts to minor negative or positive, as new finds of cave breccia will contribute significantly to our knowledge of the past eco-systems and the rise of humankind in this part of Africa.

However, in all cases mitigation will reduce the significance of impacts to low and the one very important (graveyard site) on Site 3 will almost certainly be avoided. There are no preferences in terms of the type of technology to be employed, since all would present similar impacts to heritage resources.

14 REFERENCES

14.1 Published Sources

Almond J.E. and Pether J. 2008. Palaeontological Heritage of the Western Cape. Internal Report Heritage Western Cape.

Amery, LS. 1900. The Times History of the War in South Africa, 1899-1902. London. S. Low, Marston.

Bamford M. 2011. Desktop study Palaeontology Ermelo to Empangeni – Eskom powerline. Internal report Bernard Price Institute for Palaeontological Research, University of the Witwatersrand.

Bergh, J.S. (ed.). 1999. Geskiedenisatlas van Suid-Afrika: Die Vier Noordelike Provinsies. J.L. van Schaik. Pretoria.

Blake, A. 2010. Boereverraaier: Teregstellings tydens die Anglo-Boereoorlog. Tafelberg Utigewers, Kaapstad.

Breutz, P.J. 1955. The Tribes of the Mafeking District. Department of Native Affairs, Ethnological Publications No. 32, Pretoria.

Breytenbach, J.H. 1950. Dapperste onder die Dapperes in Die Huisgenoot, 1 September 1950, pp. 26, 27, 35 & 41.

Cairncross, B., Beukes, NJ., Coetzee, LL. and Rehfeld, U. 2005. The Bivalve Megadesmus from the Permian Volksrust Shale Formation (Karoo Supergroup), northeastern Karoo Basin, South Africa: implications for late Permian Basin development. South African Journal of Geology 108: 547-556

Cloete, PG. 2000. The Anglo-Boer War - a Chronology. Pretoria. JP Van Der Walt

Davenport, J. 2013. Digging Deep: A History of Mining in South Africa. Jonathan Ball Publishers. Johannesburg and Cape Town.

Erasmus, BPJ. 2014. On Route in South Africa. Jonathan Ball Publishers.

Groenewald G.H., Groenewald D.P. and Groenewald S.M., 2014. Palaeontological Heritage of the Free State, Gauteng, Limpopo, Mpumalanga and North West Provinces. Internal Palaeotechnical Reports, SAHRA.

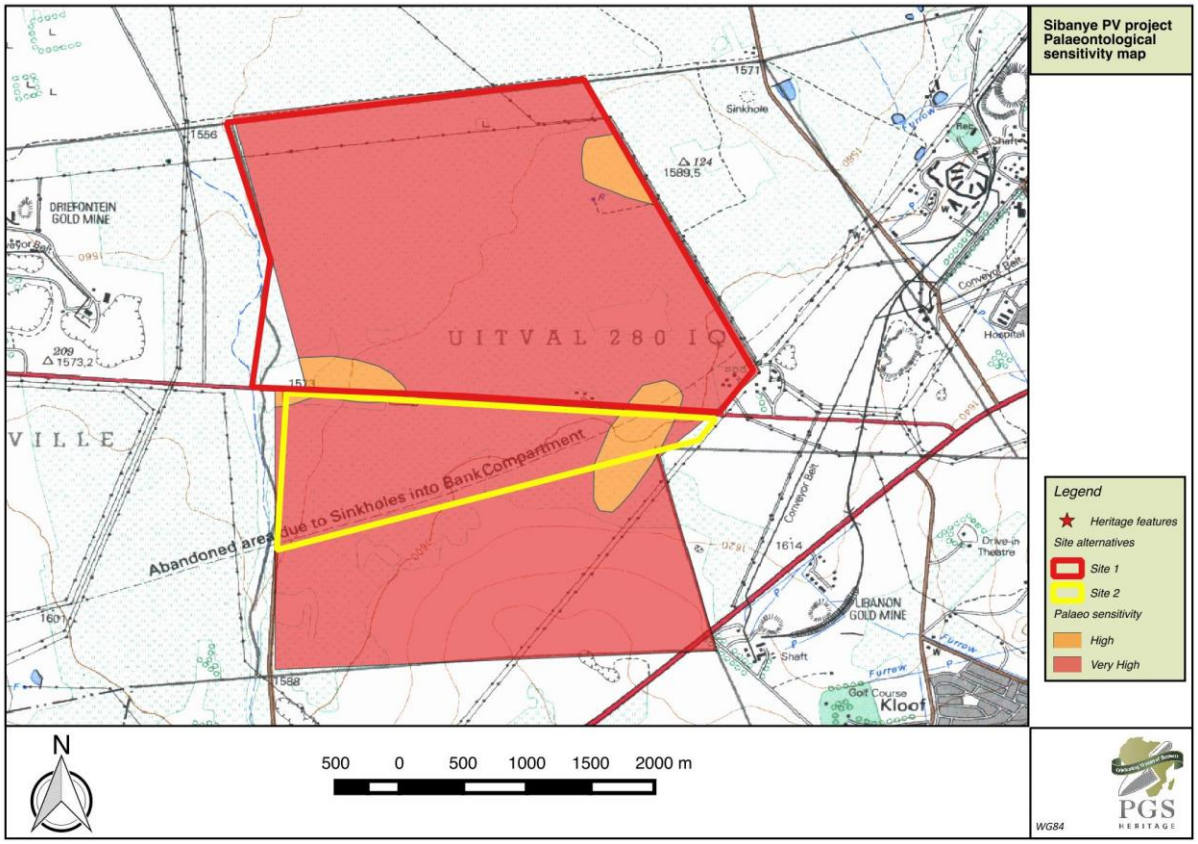
Hall, S. 2007. Tswana History in the Bankenveld in Bonner, P *et al*. A Search for Origins: Science, History and South Africa's 'Cradle of Humankind'. Wits University Press, Johannesburg.

Huffman, T.N. 2007. Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming. Societies in Southern Africa. University of KwaZulu-Natal Press, Scottsville.
Johnson MR, Anhausser CR and Thomas RJ. 2009. The Geology of South Africa. Geological Society of South Africa.
Kuman K & R. J. Clarke. 1986. Florisbad - New Investigations at a Middle Stone Age Hominid Site in South Africa. Geoarchaeology: An International Journal, Vol. 1, No. 2, 103-125 (1986). John Wiley & Sons, Inc.
Legassick, M. 2010. The politics of a South African frontier: the Griqua, the Sotho-Tswana and the missionaries, 1780 – 1840. Basler Afrika Bibliographien, Basel.
MacRae, C. 1999. Life Etched in Stone. Geological Society of South Africa, Linden, South Africa.
Mason TR and Christie ADM 1986. Palaeoevironmental significance of ichnogenus Diplocraterion torell from the Permian Vryheid Formation of the Karoo Supergroup, South Africa. Palaeogeography, Palaeoclimatology, Palaeoecology 53(3-4):249-265.
McCarthy T and Rubidge BS. 2005. Earth and Life. 333pp. Struik Publishers, Cape Town.
Malan, W. 1939. Die Dood van Danie Theron in Die Huisgenoot, 6 October 1939, pp. 29 – 31.
Mason, R.J. 1969. The Oppermansdrif Dam Archaeological Project: Vaal Basin in The South African Archaeological Bulletin, Vol. 24, No. 95/96, pp. 182-192.
Oberholster, J.J. 1972. The Historical Monuments of South Africa. The Rembrandt van Rijn Foundation for Culture, Stellenbosch.
Raper, PE. 1983. Dictionary of Southern African Place Names. Head, Onomastic Research Centre, HSRC
Swart, Marius J. 1989. Afrikanerbakens. Johannesburg: Federasie van Afrikaanse Kultuurvereniginge. pp 147-149.
Van Onselen, C. 1996. The Seed is Mine: the life of Kas Maine. David Philip, Cape Town.

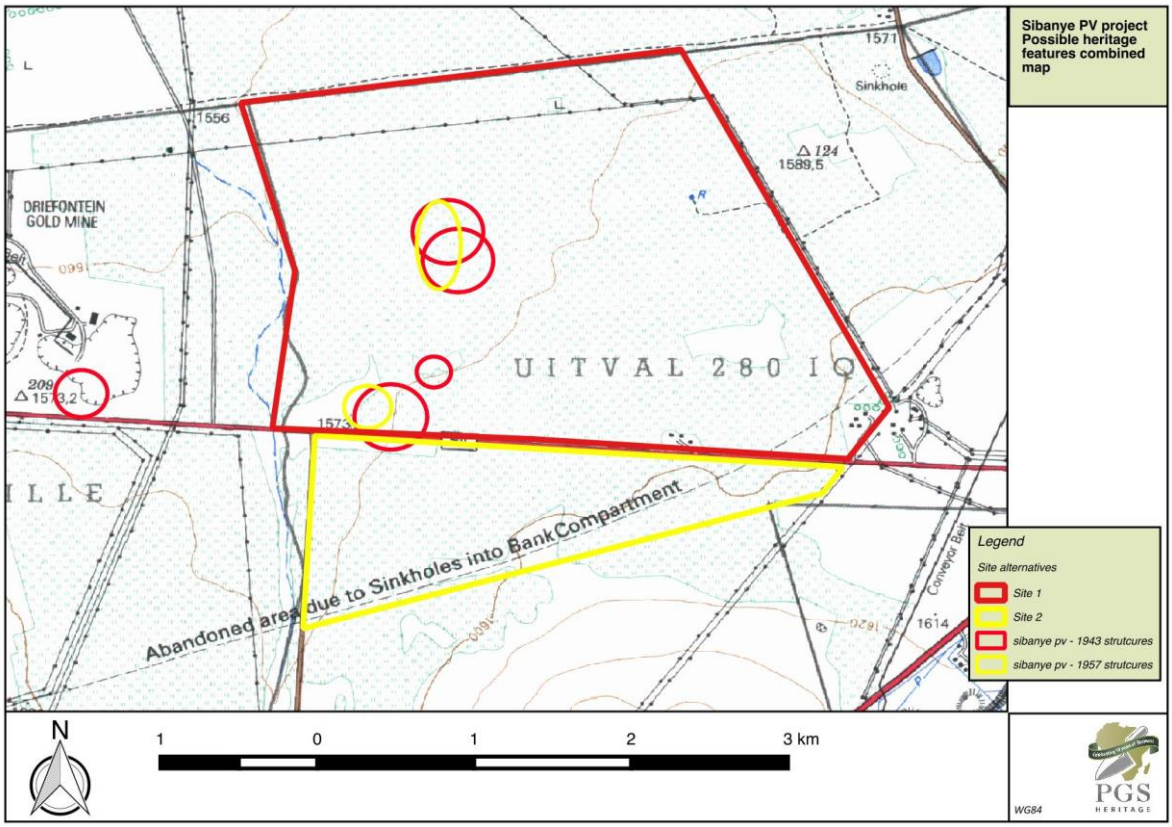
14.2 Unpublished Sources

Arup. 2015. Sibanye Gold Solar Project. Concept Design Report (Report No. ArupD14). Unpublished report for Sibanye Gold.
Aurecon. 2015. EIA for a 200MW photovoltaic energy facility proposed for Sibanye Gold, Gauteng. Site alternatives assessment (using a multi-criteria decision-making model).
Birkholtz, P.D. 2008. Heritage Inventory AngloGold Ashanti West Wits. Unpublished Report, Archaeology Africa.
Fourie, W. 1997. 'n Argeo-Etnologiese studie van 'n Sotho-Tswana vestigingseenheid op die plaas Jachtfontein, die Gatsrandreeks, Gauteng. Unpublished Honores dissertation
Van Eeden, ES. 1998. The History of Gatsrand from the Settling of the Trekker Community circa 1839 until the Proclamation of Carletonville in 1948. Dissertation approved for the Degree Magister Artium in History in the Faculty of Arts of the Potchefstroom University for Christian Higher Education.
Vorster, L.P., 1969. Die baKwena baMare-a-Phôgôlô, met besondere verwysing na die kapteinskap en politieke organisasie (Doctoral dissertation).

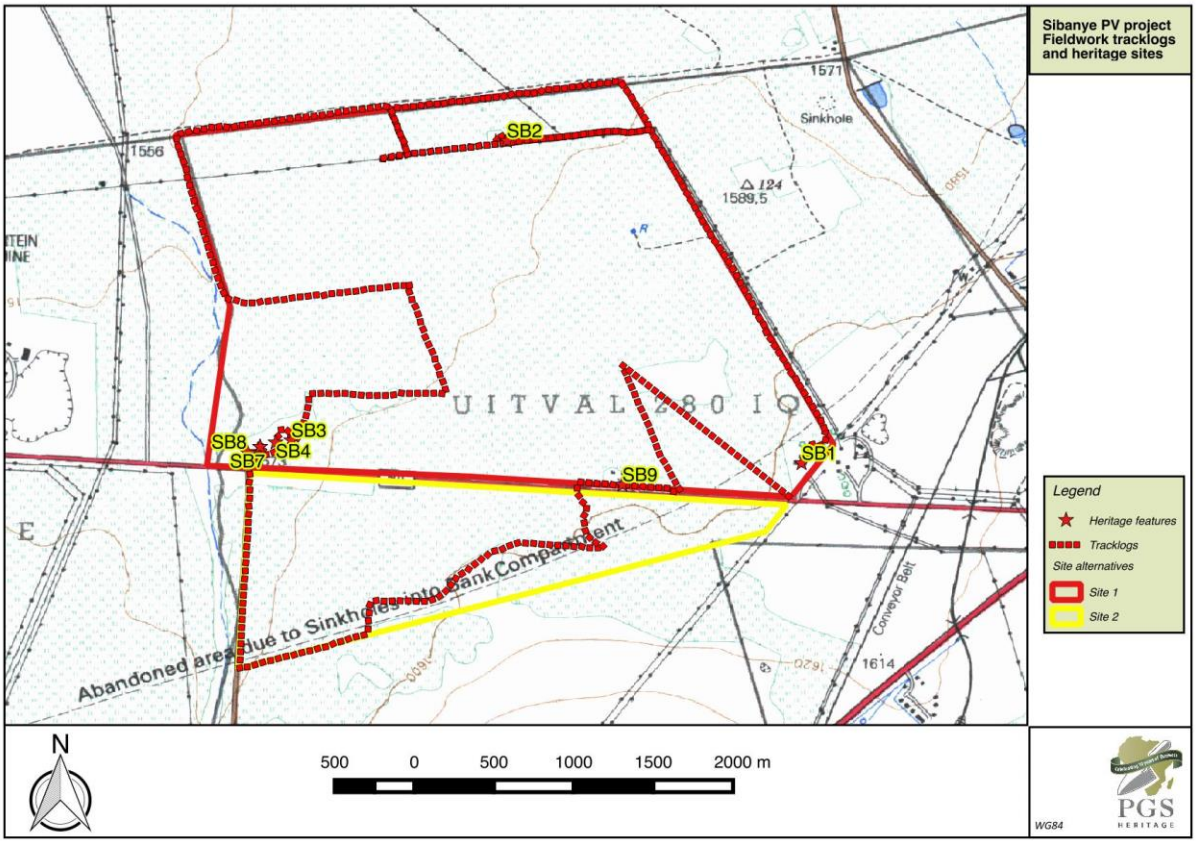
Vorster, L.P., 1981. Grondbesit en grondgebruik by die baKwenabaMare-a-Phogole (Doctoral dissertation).



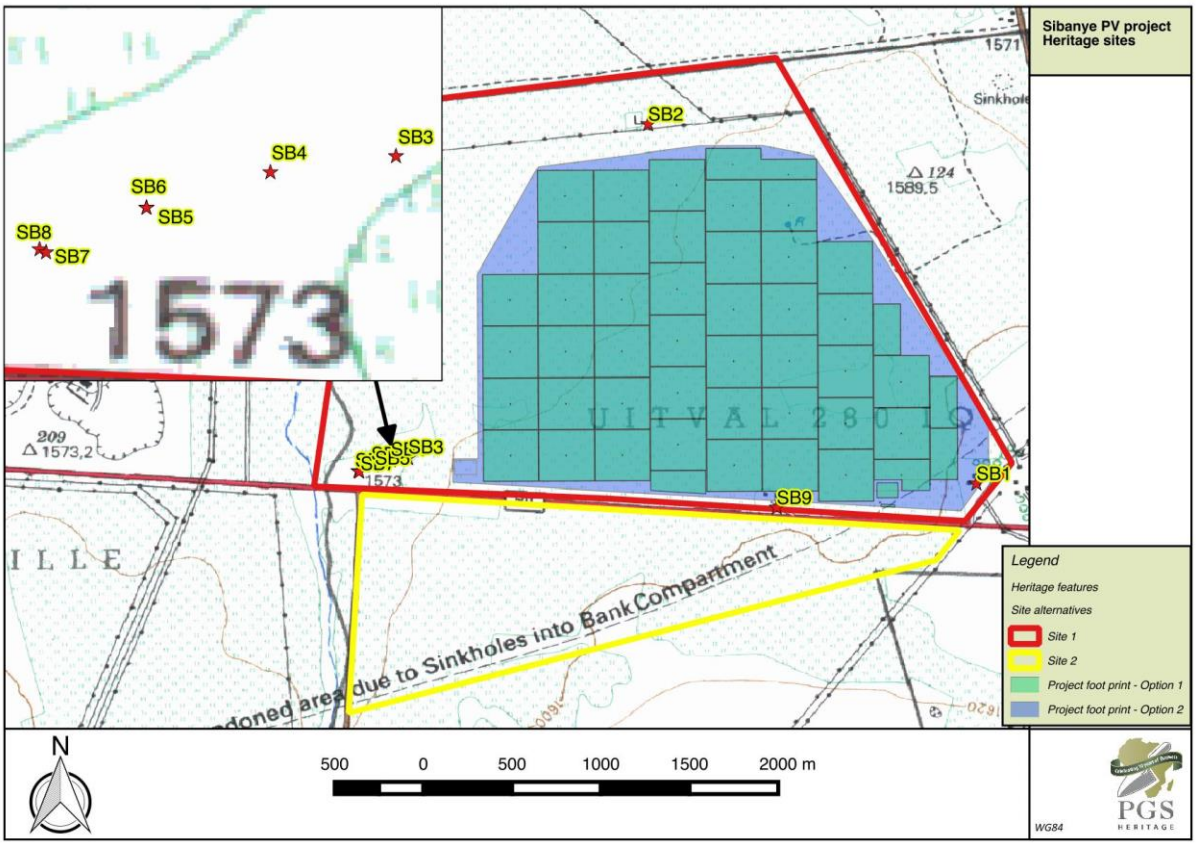
Palaeosensitivity map



Heritage sensitivity map



Tracklog map of PV Site 1 and Site 2, showing heritage sites identified



Heritage sites in relation to PV facility footprint options