Heritage Impact Assessment (HIA) Report for the ArcelorMittal South Africa (AMSA) Vanderbijlpark Solar Energy Facility

Heritage Impact Assessment

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REVISION HISTORY

Version	Issue Date	Description of Changes
01	14 October 2022	First Draft
02	23 March 2023	Additional areas assessed and amendments made on the findings

Declaration of Independence

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

Disclosure of Vested Interest

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

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ACKNOWLEDGEMENT OF RECEIPT

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The Heritage Impact Assessment Report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA): Appendix 6 of the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended, 2017) requirements for specialist reports as indicated in the table below.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in the report**
1. (1) (a) (i) Details of the specialist who prepared the report	Page ii of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to Appendix C
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	N/A
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 4.4
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Appendix A
(f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4
(g) An identification of any areas to be avoided, including buffers	Section 4
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 4.3
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Sections 4 and 6
(k) Any mitigation measures for inclusion in the EMPr	Section 7
(l) Any conditions for inclusion in the environmental authorization	Section 7
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorization	Section 7
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Sections 6 and 7
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities, or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 7
(o) A description of any consultation process that was undertaken during carrying out the study	Informal consultation in fieldwork.
(p) A summary and copies of any comments that were received during any consultation process	Not applicable. To date, no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the proposed ArcelorMittal South Africa (AMSA) Solar Energy Facility on different portions of the farms Rietkuil 551, 552 and 554 IQ, Rietspruit 583 IQ, Louisrus 586 IQ, Aspersie 553 IQ and Vanderbijlpark 550 IQ near the town of Vanderbijlpark, in the Gauteng Province.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed Project Site of the AMSA Solar Energy Facility.

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant. The HIA has shown that the Project Site and surrounding area have heritage resources with a **HIGH** to **LOW** heritage grading.

A further standalone Palaeontological Desktop Assessment (PDA) was completed for PGS Heritage by Dr Elize Butler of Banzai Environmental.

Heritage Resources

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The first phase of the field survey of the Project Site was undertaken by a combination of vehicle and pedestrian means, by one archaeologist (Michelle Sachse) and a field assistant (Xander Fourie), from 13 to 15 September 2022. The second phase of the field survey was undertaken by the same team members from PGS, on 2 March 2023.

During the fieldwork, a total of fifteen (15) heritage features and resources were identified (**Figure 59**). These consist of seven (7) burial grounds with graves (**VDB01, VDB08, VDB09, VDB11, VDB12, VDB13** and **VDB14**) and seven (7) localities with recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15**), and one (1) trigonometrical beacon (**VDB02**). See the individual site descriptions as contained in **Appendix B**. The field description forms were collected with the ArcGIS Survey123 in field software.

Archaeological Resources

No evidence for any archaeological sites could be identified within the proposed Project Site.

Burial Grounds and Graves

Seven (7) separate informal burial grounds were identified during the survey. One possible grave (**VDB01**) was identified in an open field in the eastern portion (**ASMA – 1**) of the proposed Project Site. Two informal burial grounds (**VDB08** and **VDB09**) were identified in the middle of agricultural fields, and two informal burial grounds (**VDB11** and **VDB12**) were identified close to the R57 national road. Two additional burial grounds were identified during the second phase of the fieldwork, both these burial grounds were identified in the western portion of the Project Site (**AMSA – 7**). One burial ground (**VDB13**) with approximately two graves

was identified 40m south-west of the Project Site. Another burial ground (**VDB14**) with approximately 50 graves was identified in an open field. Due to the cultural and religious significance of burial grounds, the site is graded as Grade IIIA.

The possibility of the burial grounds being impacted by the proposed Vanderbijlpark Solar Energy Facility cannot be excluded, and the project can potentially have a **HIGH** impact without mitigation. Implementation of the recommended management and mitigation measures can reduce the impact rating to **LOW**.

Historical Structures

The recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15**) are all younger than 60 years and vary in preservation. Some are abandoned and others are used as storage facilities or residential areas. The structures and remains of structures are not conservation worthy, contain no cultural or scientific value, and are consequently graded as **not conservation worthy (NCW)**.

The trigonometrical beacon (**VDB02**) is older than 60 years as it was identified during a desktop study of historical topographical maps from the 1950s. The beacon does have historical value and is still in good condition. The site has a moderate heritage significance and is graded as Grade IIIB.

The impact on the recent historic structures identified during the fieldwork could have a **LOW** significance before and after implementing the proposed mitigation measures.

Palaeontology

The proposed development is largely underlain by Quaternary deposits, while a portion is underlain by the Vryheid Formation (Ecca Group, Karoo Supergroup). A small portion in the west is underlain by diabase, while a portion in the south-west is underlain by the Daspoort Formation of the Pretoria Group (Transvaal Supergroup).

According to the PalaeoMap of the South African Heritage, Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Quaternary alluvial deposits are Low, while the Quaternary Superficial deposits have a Moderate Palaeontological Sensitivity and that of the Vryheid Formation is Very High. The Pretoria igneous intrusions have Zero Palaeontological Sensitivity while that of the Daspoort Formation is High. Updated (Council of Geosciences, Pretoria) indicates that the study area is largely underlain by Quaternary alluvium, colluvium, alluvium and gravel.

It is thus recommended that a Phase 1 field-based assessment report be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the likely impacts.

Recommendations

The HIA concludes that heritage resources are present within the Project Site of the Vanderbijlpark Solar Energy Facility. The initial projected impact is rated as **MODERATE** to **HIGH** before mitigation measures.

Through the combination of the various environmental, cultural, and socio-economic sensitivities, the client can develop various layout options that will reduce the impact on the heritage resources. There is, however, a possibility that the combined sensitivity mapping can lead to some of the heritage resources not being accommodated in the layouts.

Mitigation measures

Mitigation measures are described in **Table 16** of this report.

Conclusion

It is the combined considered opinion of the heritage specialists that the proposed project will have a direct impact on several identified heritage resources rated as being of **LOW** to **HIGH** heritage significance. Provided that the recommended mitigation measures are implemented, the impact would be acceptably **LOW** or could be mitigated to the degree that the project could be approved from a heritage perspective. The management and mitigation measures as described in **chapter/section 7** of this report have been developed to minimise the project impact on heritage resources.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

TERMINOLOGY AND ABBREVIATIONS

Archaeological Resources

This includes:

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

Cultural Significance

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

Development

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

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

Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Fossil

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

Heritage

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

Heritage Resources

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

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

Holocene

The most recent geological period commenced 10 000 years ago.

Late Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

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

Palaeontology

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

Project Site

Refers to the four different areas located within and outside the AMSA works area.

Abbreviations	Description
AD	Anno Domini (“in the year of our Lord”)
AIA	Archaeological Impact Assessment
AMSA	ArcelorMittal South Africa
APHP	Association of Professional Heritage Practitioners
ASAPA	Association of South African Professional Archaeologists
BGG	Burial Grounds and Graves
CRM	Cultural Resource Management
DFFE	Department of Forestry, Fisheries and Environmental Affairs
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
GN	Government Notice
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LCT	Large Cutting Tools
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PDA	Paleontological Desktop Assessment
PHRA-G	Gauteng Provincial Heritage Resources Authority
PHS	Provincial Heritage Site
PGS	PGS Heritage
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
VDB	Vanderbijlpark Site Number

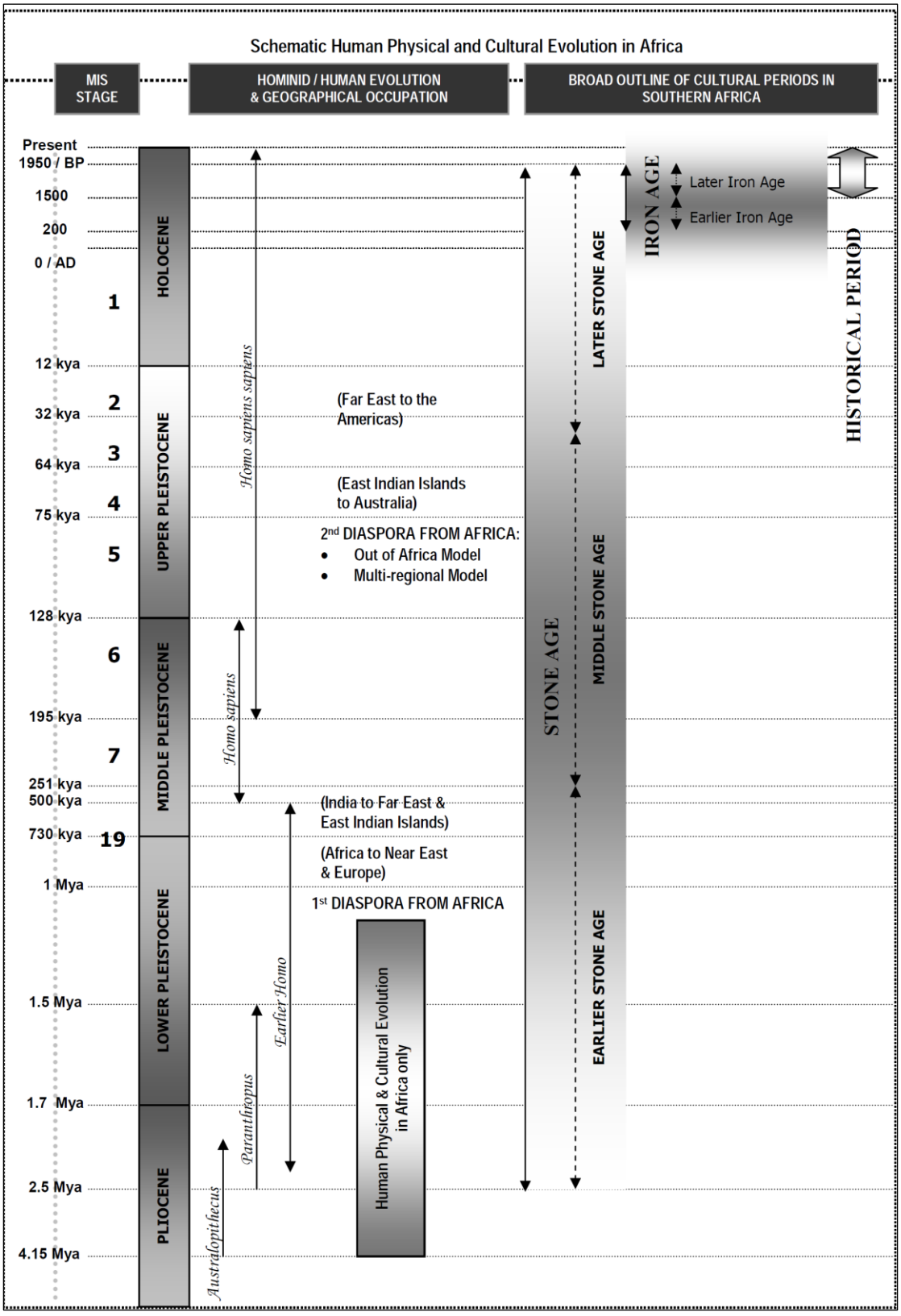


Figure 1 – Human and Cultural Timeline in Africa

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Savannah Environmental (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the proposed ArcelorMittal South Africa (AMSA) Solar Energy Facility on different portions of the farms Rietkuil 551, 552 and 554 IQ, Rietspruit 583 IQ, Louisrus 586 IQ, Aspersie 553 IQ, and Vanderbijlpark 550 IQ near the town of Vanderbijlpark, in the Gauteng Province (hereafter referred to as the “Project”).

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed Project Site of the “Project”.

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant. The HIA has shown that the Project Site and surrounding area have heritage resources with a **HIGH** to **LOW** heritage grading.

A further standalone Palaeontological Desktop Assessment (PDA) was completed for PGS Heritage by Dr Elize Butler of Banzai Environmental.

1.1 Scope of the Study

The study aims to identify heritage sites and finds that may occur in the proposed Project Site. The HIA aims to inform the EMPr to assist the developer in responsibly managing the discovered heritage resources, to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 70 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Michelle Sachse, the author of this report, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist, membership number - 526. She holds a master's degree (MA) in Archaeology from the University of Pretoria.

Wouter Fourie, the Project Coordinator and Archaeologist, 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).

Xander Fourie is an archaeological field assistant, who is currently busy with his undergraduate studies in archaeology.

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and existing vegetation cover. It should be noted most of the Project Site was accessible for the fieldwork survey.

Fieldwork was focused on areas that were not previously ploughed or disturbed by farming activities, thus focussing on areas with the highest potential to yield heritage resources. Most of the survey was conducted on foot, and in areas where land was previously or is currently used for agricultural purposes, dirt roads were driven at a slow pace while observing the surrounding areas.

Some areas were not possible to access due to small rivers, streams and/or wetlands. In other cases, fences or operational activities prohibited the surveying team to enter certain areas. The area delineated as 'inside the works' was already highly disturbed by industrial activities such as infrastructure, railway lines and clearing and dumping activities. The additional areas identified as inside the works were also very overgrown, with grasses and weeds reaching a height of almost 2 metres. These areas were very difficult to survey as ground cover limited visibility and made walking nearly impossible.

Therefore, a heritage specialist must be contacted immediately if any heritage features and/or objects are located or observed outside the identified heritage-sensitive areas during the construction activities. Such observed or located heritage features and/or objects may only be disturbed or removed in such time that the heritage specialist has been able to assess the

significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements for graves and burials will apply as set out below.

1.4 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:

- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified
- National Environmental Management Act (NEMA), Act 107 of 1998 – Appendix 6
- National Heritage Resources Act (NHRA), Act 25 of 1999

1.4.1 Notice 648 of the Government Gazette 45421

Although minimum standards for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA, GN.648 requires sensitivity verification for a site selected on the national web-based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this Government Notice (GN) are listed in **Table 1** and the applicable section in this report is noted.

Table 1: Reporting requirements for GN648

GN 648	Relevant section in the report	Where not applicable in this report
2.2 (a) a desktop analysis, using satellite imagery;	section 4.3	-
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	4.1	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool;	section 4.1	-
2.3(b) contains motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity;	section 4.1	-

1.4.2 NEMA – Appendix 6 Requirements

The HIA report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below. For ease of reference, the table below provides cross-references to the report sections where these requirements have been addressed.

1.4.3 The National Heritage Resources Act

- National Heritage Resources Act (NHRA) Act 25 of 1999
    - Protection of Heritage Resources – Sections 34 to 36; and
    - Heritage Resources Management – Section 38

The NHRA is utilised as the basis for identifying, evaluating, and managing heritage resources. In the case of Cultural Resource Management (CRM) those resources are impacted explicitly by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Locality

The proposed Vanderbijlpark Solar Energy Facility is located approximately 5 km to the north of the city of Vanderbijlpark, in the Emfuleni Local Municipality and the Sedibeng District Municipality, within the Gauteng Province. The proposed Project Site is flanked and divided by several national roads including the N1, R54 and the R553. The R57 national road runs through the middle of the largest area (AMSA – 3). Several industrial, agricultural, and residential areas are in proximity to the proposed Project Site (**Figure 2**).

2.1.1 Site Description

The proposed Project Site is situated on several different portions of the farms Rietkuil 551, 552 and 554 IQ, Rietspruit 583 IQ, Louisrus 586 IQ, Aspersie 553 IQ and Vanderbijlpark 550 IQ with a footprint area of approximately 2784ha (**Figure 2**).

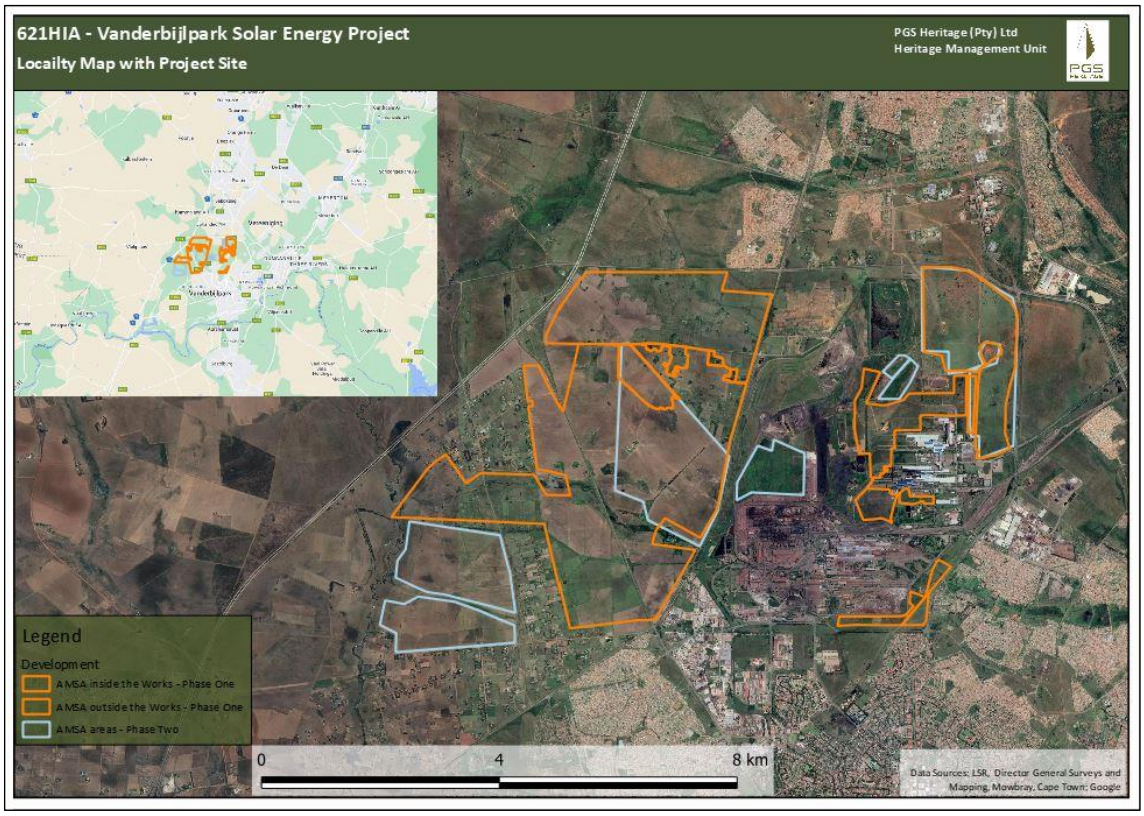


Figure 2 - Regional Locality of the Project Site (orange and blue polygon).

2.2 Technical Project Description

2.2.1 Project Description

ArcelorMittal South Africa proposes the development of a solar energy facility to generate 100MW on-site at Vanderbijlpark. Grid connection will most likely be at 132kV capacity. Use would be made of Eskom's grid to facilitate the connection of the facilities to the grid. Details of the exact grid connection solution are to be finalized. The power line is expected to be between 2km and 4km. Consideration of the grid infrastructure will be done together with the solar energy facility in a single application process.

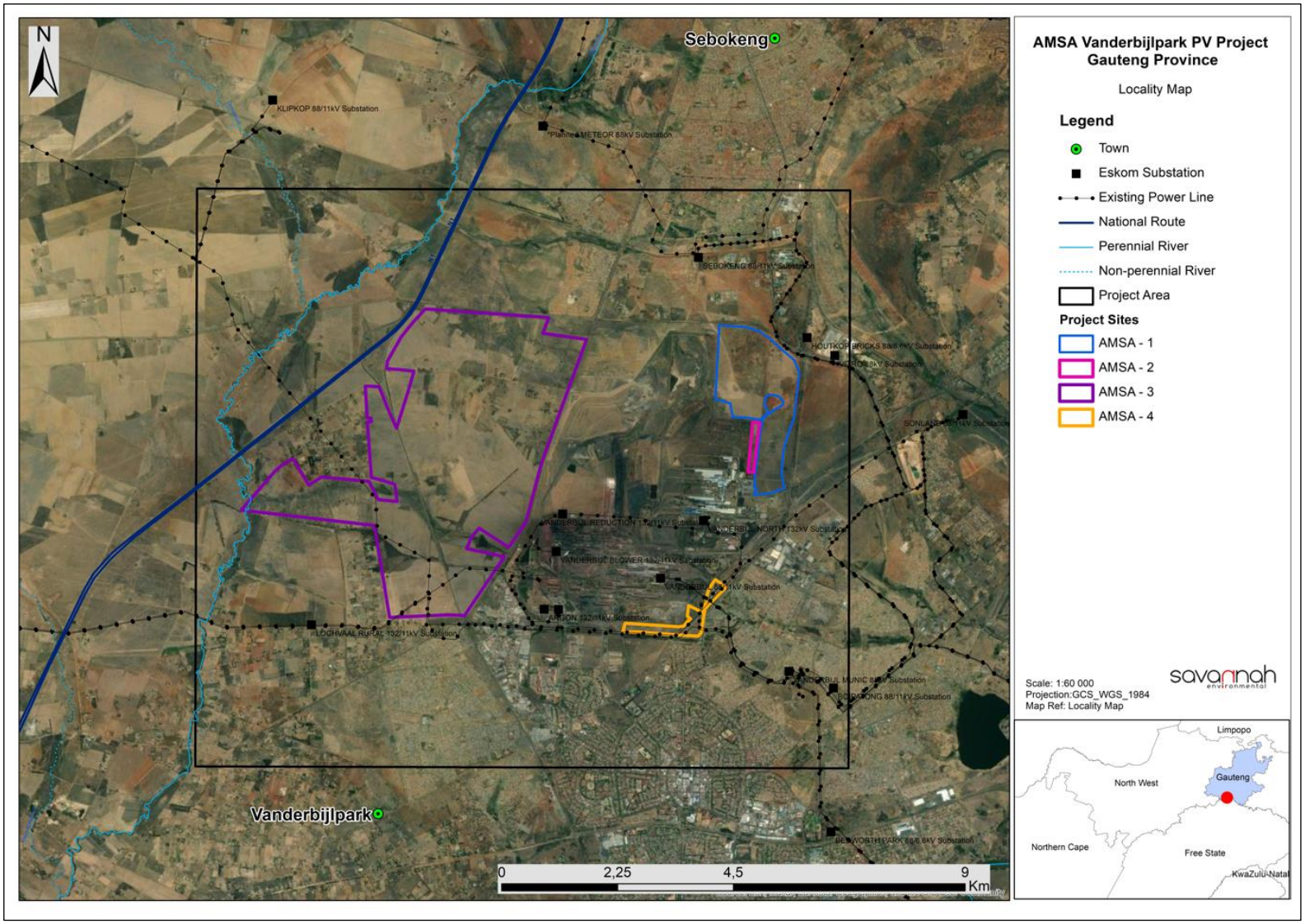


Figure 3 – AMSA Vanderbijlpark PV Project, Gauteng Province, Locality Map (Provided by Savannah Environmental).

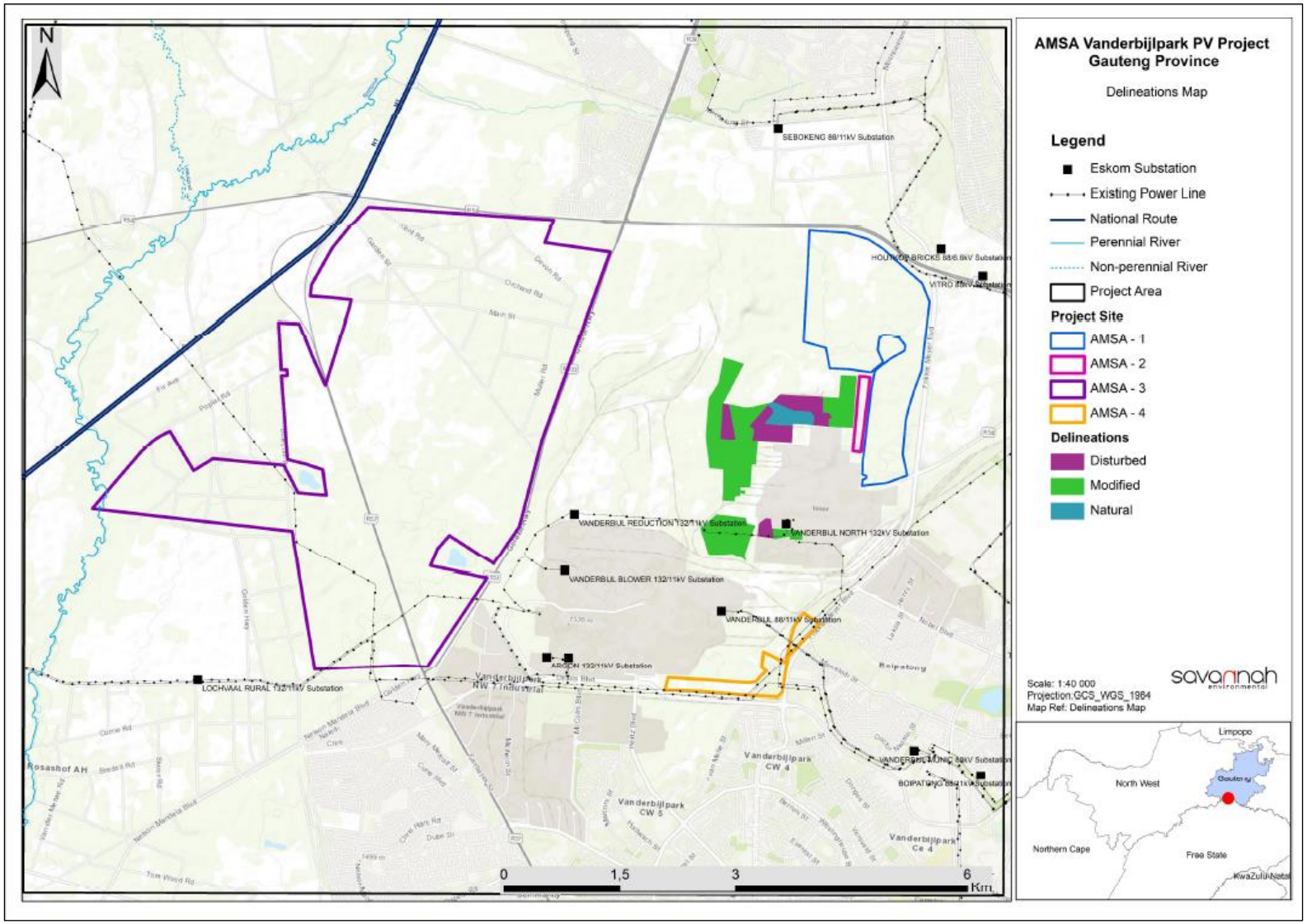


Figure 4 - AMSA Vanderbijlpark PV Project, Gauteng Province, Delineations Map (Provided by Savannah Environmental).

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site Significance

This HIA report was compiled by PGS for the proposed Vanderbijlpark Solar Energy Facility. The applicable maps, tables and figures are included, as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (No. 107 of 1998). The HIA process consists of three steps:

Step I – Literature Review and initial site analysis: The background information to the field survey relies greatly on Heritage Background Research which was undertaken through archival research and evaluation of satellite imagery and topographical maps of the study area.

Step II – Physical Survey: A physical survey was conducted by a combination of vehicle and pedestrian access through the proposed project area by one qualified heritage specialist and one field assistant (between 13 and 15 September 2022 and again on 2 March 2023), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

Impacts on these sites by the development will be evaluated as follows:

3.1.1 Site Significance

Site significance classification standards use is based on the heritage classification of s3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The updated classification and rating system as developed by Heritage Western Cape (2021) is implemented in this report.

Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016), were used for this report (**Table 2** and **Table 3**).

Table 2: A rating system for Archaeological Resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfil one of the criteria set out in section 3(3) of the Act but that do not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	The resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significance to those of a Grade III A resource, but to a lesser degree.	The resource must be retained where possible, and where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	The resource must be satisfactorily studied before impact. If the recording was already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

Table 3: A rating system for built Environment Resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared a National Heritage Site managed by SAHRA.	Highest Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at a local level.	High Significance
IIIB	Such a resource might have similar significance to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement, or community.	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at a local level.	Medium Significance
IIIC	Such a resource is of contributing significance to the environment. These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e., in large part due to its contribution to the character or significance of the environs. These buildings and sites should, consequently, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough	No further actions under the NHRA are required. This must be motivated by the applicant	No research potential or

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
	heritage significance to be retained as part of the National Estate.	and approved by the authority. Section 34 can even be lifted by HWC for structures in this category if they are older than 60 years.	other cultural significance

3.2 The Methodology used in Determining the Significance of Environmental Impacts

The methodology used to determine the environmental impact significance was provided by Savannah Environmental (Pty) Ltd and is explained in **Appendix B**.

4 CURRENT STATUS QUO

4.1 Site Description

During the first phase of the fieldwork, the proposed Project Site was divided into two different parts (the three areas inside the AMSA works and the four areas outside the AMSA works). The one area (**AMSA – 4**) outside the AMSA works located in the southwest corner has been removed from the planned operations. Thus, three areas were surveyed inside AMSA and three areas (**AMSA – 1, AMSA – 2**, and **AMSA – 3**) outside AMSA. All the areas surveyed were previously disturbed in varying degrees, which range from agricultural activities to large-scale development and industrial activities. During the second phase of the fieldwork, two additional areas were surveyed inside the AMSA works, and two areas outside the AMSA works located right next to one another (**AMSA – 5**).

The three areas inside the AMSA works can be characterised as open flat grassy fields. Infrastructure located within these areas includes large buildings (**Figure 6**), railway tracks (**Figure 7 - Figure 8**), powerlines (**Figure 9**), and tar- and dirt roads (**Figure 10 - Figure 11**). Heavy-duty vehicles were observed driving in the area, which was busy transporting material, as well as clearing certain areas for future development (**Figure 12**). These areas also contained sections where wetlands and man-made dams are currently located (**Figure 13 - Figure 14**).

The **AMSA – 1, AMSA – 2 and AMSA – 3** outside are mainly characterised as both flat open grassy fields and large agricultural areas.

The **AMSA – 1 and AMSA – 2** have evidence of being previously disturbed, and there are dirt roads located across the area which is currently being used by heavy-duty vehicles to transport material. There is also a lot of dumping in the area as well as many old excavations (**Figure 15 -**

Figure 16). Some old farm roads (**Figure 17**) were observed in certain areas as well as existing powerlines (**Figure 18**). The open fields are also currently used as grazing for cattle (**Figure 19**).

The **AMSA – 3** is almost completely covered in agricultural fields (**Figure 21**). Large tracks of the property were previously ploughed for crop cultivation since the early 1940s as is evident from historical topographical maps and historical aerial photography (**Figure 22**). Across the area, many ruins of old buildings could be seen (**Figure 23 - Figure 24**), most were barely visible as just the foundations were still evident. The north-eastern corner of the largest area was characterised as a residential zone since the 1950s, with more structures appearing on the topographical maps as the years go by. However, it appears that many of the buildings were demolished and are currently abandoned except for a few that are still used as storage space or residence (**Figure 25**). People were seen grazing with their cattle and goats in certain areas (**Figure 26**). Other features that occur in the area include a large wetland and dam (Figure 27), powerlines (**Figure 28**), telephone lines (**Figure 29**), tar- and dirt roads **(Figure 30**), and a service road (**Figure 31**) leading under the R57 national road. The AMSA industrial works can be seen from these properties as well (**Figure 32**).

The two additional areas inside the AMSA works were both characterised as being very overgrown (Figure 33) and difficult to survey. Both areas have been previously disturbed by agricultural activities. These areas are surrounded by dirt roads used by vehicles inside the AMSA works. Both areas contain sections of wetlands (Figure 34), and the larger area is located adjacent to a man-made dam (**Figure 35**).

The **AMSA – 5** which is located south-west of **AMSA – 3** is characterised by open flat fields. Currently there are cattle grazing in the area (Figure 36). An old reservoir (Figure 37) is located here as well as the remains of old structures (**Figure 38**). A sub-station (Figure 39) and the associated powerlines (**Figure 40**) are also located in this area. The area was accessed using old farm roads (**Figure 41**). A stream (**Figure 42**) runs through the north-eastern section of the area, and there are some areas where dumping was observed.

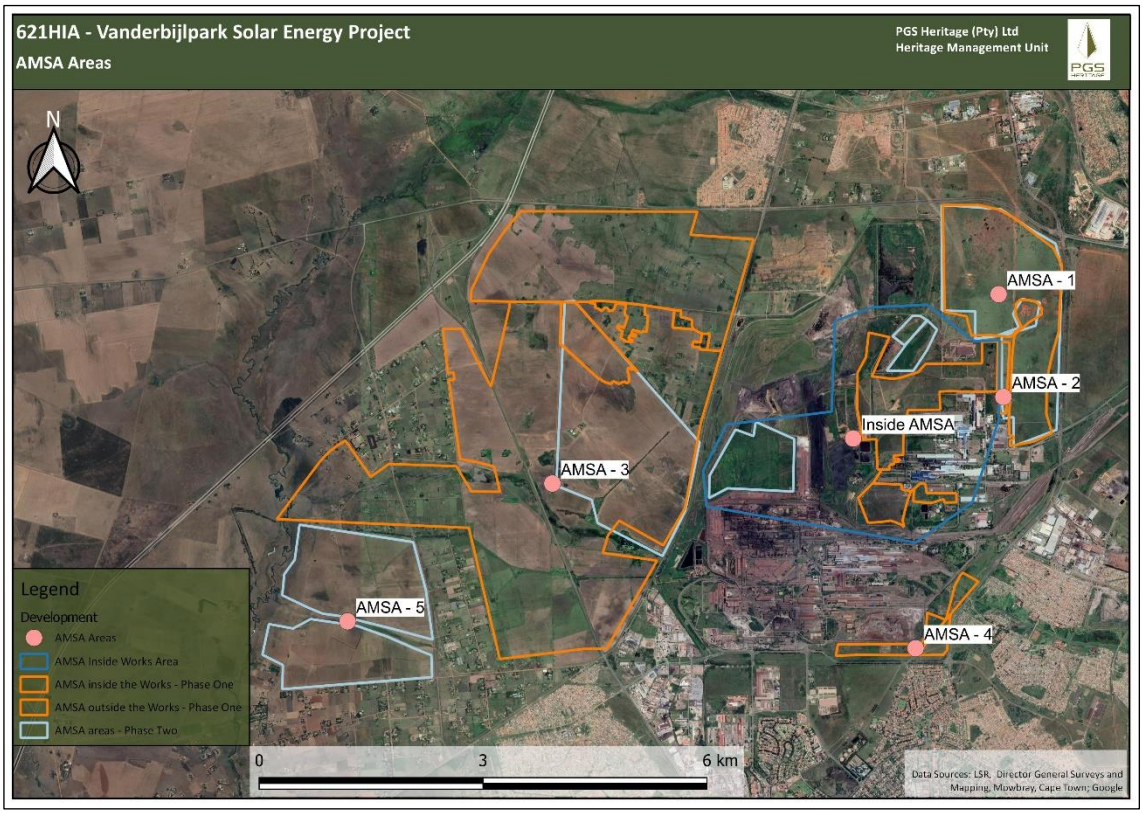


Figure 5 - Different AMSA Areas within the Project Site.

In terms of topography, the study area can be described as primarily flat.

In terms of vegetation, the portion of the study area is located within the Soweto Highveld Grassland vegetation type. This vegetation type is described as, "*Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by Themeda triandra and accompanied by a variety of other grasses such as Elionurus muticus, Eragrostis racemosa, Heteropogon contortus and Tristachya leucothrix. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.*" (www.sanbi.org).

In terms of geology and soils, the Soweto Highveld Grassland type is "*Shale, sandstone, or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.*" (www.sanbi.org).

Overall, the accessibility of the project footprint area was good, although difficult to navigate in some areas. Several photographs below provide general views of the Project Site and the landscape within which it is located.

Existing land uses associated with the project area and its immediate surroundings, include (**- Figure 32**):

- AMSA Industrial Complex;
- Sub-station;
- Existing powerlines;
- Existing Telephone lines;
- Wetlands;
- Dams;
- Agricultural fields;
- Grazing for domestic animals;
- Residential and storage structures and
- National and dirt roads.

Figure 6 - Large building located within the AMSA works area.

Figure 7 - View of railway tracks located within the AMSA works area.

Figure 8 - View of railway tracks within the AMSA works area.

Figure 9 - General view of the powerlines located within the AMSA works area.

Figure 10 - View of a tar road located within the AMSA works area.

Figure 11 - View of a dirt road located within the AMSA works area.

Figure 12 - Site clearing activities within the AMSA works area.

Figure 13 - General view of a large dam and a wetland located within the AMSA works area.

Figure 14 - General view of a large dirt road used by heavy-duty vehicles, located in the AMSA -1 area.

Figure 15 - Evidence of dumping located in the AMSA – 1 area.

Figure 16 - Evidence of dumping located in the AMSA – 1 area.

Figure 17 - General view of an old farm road located in the AMSA – 1 area.

Figure 18 - General view of powerlines located in the AMSA – 1 area.

Figure 19 - General view of cattle grazing located in the AMSA – 1 area.

Figure 20 - General view of the AMSA – 2 area.

Figure 21 - General view of agricultural fields, with no current crop cultivation, located in the AMSA – 3 area.

Figure 22 – Section of a historical aerial photograph (221_004_95154_1948) taken in 1948 indicating a large area being used for agricultural use within the AMSA – 3 area.

Figure 23 - General view of the ruins of structures in the area, located in the AMSA – 3 area.

Figure 24 - General view of ruins of structures located in the AMSA – 3 area.

Figure 25 - General view of a residential building which is currently being used, located in the AMSA – 3 area.

Figure 26 - General view of cattle grazing, located in the AMSA – 3 area. The R554 national road can be seen in the background.

Figure 27 - General view of a large dam and wetland located in the AMSA – 3 area. Just opposite the AMSA industrial works.

Figure 28 - General view of powerlines located in the AMSA – 3 area.

Figure 29 - General view of telephone lines located in the AMSA – 3 area.

Figure 30 - General view of a dirt road and the R554 national tar road located in the AMSA – 3 area.

Figure 31 - General view of a service road that goes underneath the R554 national road, located in the AMSA – 3 area.

Figure 32 - General view of the AMSA industrial works in the distance.

Figure 33 - General view of the overgrown vegetation inside the AMSA works.

Figure 34 - Wetlands located inside the AMSA works.

Figure 35 - Man-made dam located inside the AMSA works.

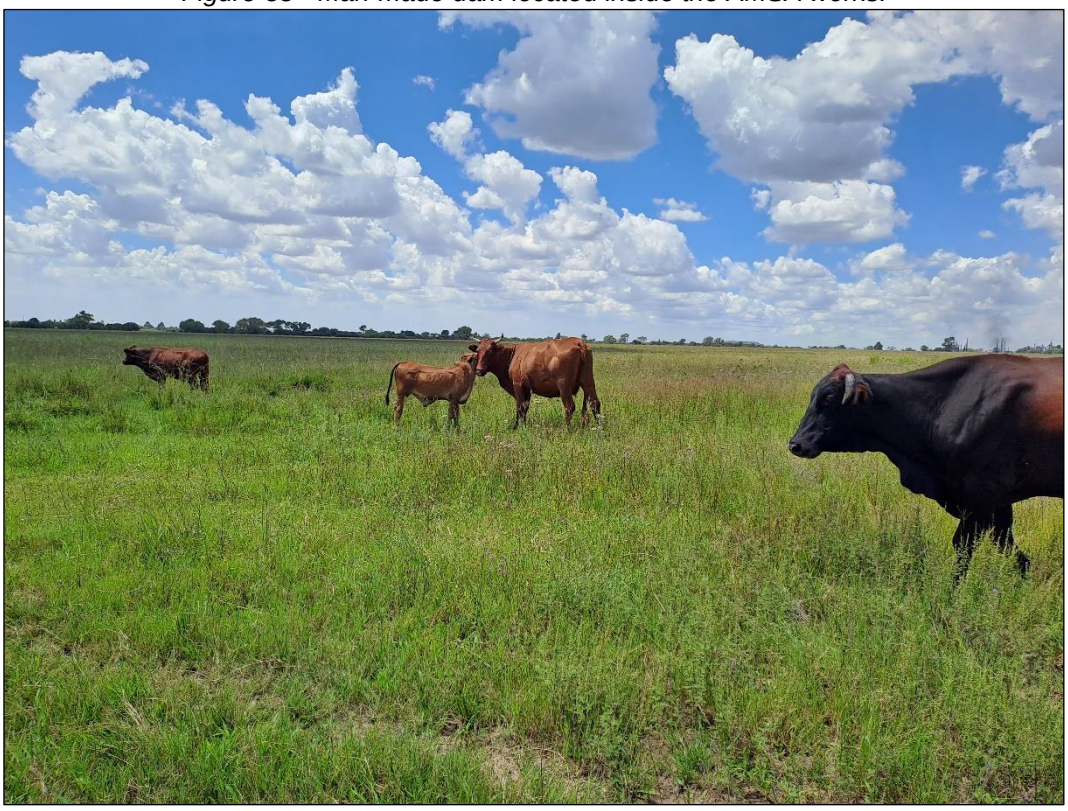


Figure 36 - Cattle grazing in the AMSA – 5 area.

Figure 37 - Round reservoir made up of brick and concrete within the AMSA – 5 area.

Figure 38 - Remains of old structures within the AMSA – 5 area.

Figure 39 - Sub-station located within the AMSA – 5 area.

Figure 40 - Powerlines located within the AMSA – 5 area.

Figure 41 - Old farm roads located across the AMSA – 5 area.

Figure 42 - Stream located within the AMSA – 5 area.

4.2 Overview of the Study Area and Surrounding Landscape

DATE	DESCRIPTION
2.5 million – 250 000 years ago	The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian which comprises more refined and better-made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates to approximately 1.5 million years ago. Several ESA sites are known from the confluence of the Klip, Suikerbosrand and Vaal Rivers in proximity to the town of Vereeniging, which is located approximately 10km northeast from the Project Site. These sites include Klipplaatdrift, River View Estates and Three Rivers (Bergh 1999). Another Early Stone Age was identified by C van Riet Lowe during the late 1940s near Henley-on-Klip (Van Riet Lowe & Van der Elst, 1949). Several Acheulean-bearing sites are known from the Vereeniging area. According to Bergh (1999), these include Waldrif, Drie Riviere, Duncanville, and Riverview Estates. The Duncanville Archaeological Reserve was proclaimed a National Monument in 1944 (Oberholster, 1972). The site contains many Acheulian stone implements lying on the surface of the gravel beds deposited by the Vaal River several million years ago. A similar site is located at the Klip River Quarry (also now a Provincial Heritage Site). Both sites were discovered initially by T N Leslie, an engineer, and later investigated by Van Riet Lowe, who was instrumental in them being declared National Monuments. These two sites were both excavated by Revil Mason between 1960/61 (Prins, 2005).
250 000 to 40 000 years ago	The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured using the so-called 'prepared core' technique. This phase is furthermore associated with modern humans and complex cognition (Wadley 2013). Although not many MSA sites are known from this area, MSA stone tools were identified on a property in Meyerton (located approximately 20km northeast of the Project Site) in a stratigraphic context for an HIA undertaken in 2017 (Fourie 2017). No archaeological work has been carried out in this 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. A well-known feature of the Later Stone Age is rock art in the form of rock paintings and engravings. One identified LSA site has been found in the region of Meyerton (located approximately 20km northeast of the Project Site) (Huffman, 2008), although no archaeological work has been carried out in this area concerning this techno complex.
AD 1450 – AD 1650	Evidence of the Late Iron Age (1500-1800 AD) is prevalent in the

DATE	DESCRIPTION
	Suikerboschrand and Klipriviersberg area. Other Late Iron Age stone-walled sites, dating from the 18th and 19th centuries, occur towards Alberton, along the rocky ridges of the eastern part of the Klipriviersberg (Huffman, 2007). This period is associated with a Late Iron group referred to as the Ntsuanatsatsi facies of the Urewe Tradition (Huffman, 2007). The Ntsuanatsatsi facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the earliest known Iron Age period within the region of the study area. The decoration on the ceramics from this facies is characterised by a broad band of stamping on 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 incisions separated by colour (Huffman, 2007).
AD 1650 – AD 1850	The Uitkomst facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the third Iron Age period to be identified for the surroundings of the study area. The decoration on the ceramics associated with this facies is characterised by stamped arcades, appliqué of parallel incisions, stamping as well as cord impressions (Huffman, 2007). Based on the available archaeological and oral evidence from this period, the sixteenth and seventeenth centuries saw the movement of Sotho/Tswana communities from the lower-lying Bushveld areas in the north (where they had been settled since AD 1500) toward the higher, predominantly grassland areas to the south. By AD 1650, these communities had successfully settled in these areas (Hall, 2007).
AD 1700 - 1840	The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the next phase to be identified within the study area's surroundings. The key features of decorated ceramics include rim notching, broadly incised chevrons, and white bands, all with red ochre (Huffman, 2007).
1823s	By 1823 the Khudu were known to have resided in the general vicinity of the present study area, especially near the confluence of the Suikerbosrant and Vaal Rivers (Bergh, 1999).
1823 - 1827	During the so-called Difaqane, the Khumalo Ndebele (also known as the Matabele) of Mzilikazi established themselves along the banks of the Vaal River and pushed the Khudu further to the west (Bergh, 1999). In c. 1827 the Matabele moved further north and settled along the Magaliesberg Mountain and five years later in 1832 settled along the Marico River.
October 1834	A group of Griqua hunters under the leadership of Pieter David were hunting near the confluence of the Vaal and Wilge Rivers when they were attacked here by Mzilikazi's Khumalo Ndebele (Bergh, 1999).

DATE	DESCRIPTION
February 1836	Voortrekker leader Louis Trichardt moved with his party to the confluence of the Wilge and Vaal Rivers and stayed on the western bank of the Wilge for a while before crossing over the Vaal (d'Assonville, 2002). They subsequently met up with Lang Hans van Rensburg at Elandspruit, near present-day Heidelberg (Bergh, 1999).
1839	These years saw the early establishment of farms by the Voortrekkers in the general vicinity of the development area (Bergh, 1999).
1876-1878	In December 1876 President Brand of the Republic of the Orange Free State acquired authority from his Volksraad to appoint Mr GW Stow to undertake prospecting surveys. In 1878 Stow conducted test shafts in the vicinity of the Taaiboschspruit and Vaal River confluence as well as on the farms Maccauvlei and Leeuwspruit. His investigations on both these latter farms indicated the presence of extensive coalfields (Leigh, 1968).
1880	After this discovery, Stow and Samuel Marks, the Kimberley diamond magnate, formed a company in 1880, to exploit the coal deposits and transport them to the Kimberley mines. The company was called “De Zuid Afrikaansche en Oranje Vrijstaatsche Kolen en Mineralen Vereeniging” and was later to become the nucleus of the Vereeniging Estates Limited. As a result, the farms Leeuwkuil, Klipplaatdrift, Maccauvlei and Rietfontein were acquired. The first mining activities were undertaken in the vicinity of the test shaft on Leeuwkuil, which later was to become Bedworth Colliery (Leigh 1968).
1882-1884	In 1882 the Vereeniging Estates Limited applied to the Zuid Afrikaansche Republiek to establish a village on the farms Leeuwkuil and Klipplaatdrift. On 4 July 1884, the Volksraad approved the application as well as the proposed name “Vereeniging”, which was derived from the company’s name (Leigh, 1968).
1899 – 1902	During the Anglo-Boer War (1899-1902) the town of Vereeniging had a significant role to play. This was largely due to its strategic value in that one of the main entry points from the Republic of the Orange Free State into the Zuid Afrikaansche Republiek was in this area. The railway link between the two republics had also been established here (Leigh 1968). During the initial phase of the war, very few military activities took place in this area. However, after the defeat of the Boer forces in various places, and the British advance into the republics, the Vereeniging area became significant. After the annexation of the Republic of the Orange Free State on 24 May 1900, Lord Roberts (the commander in chief of the British forces) was able to travel via railway line from Bloemfontein to the Vaal River (Bergh, 1999). On 27 May 1900, the crossing of the main British army over the Vaal River took place. Vereeniging was annexed on the same day. During the latter period of the war, the Boer forces divided themselves into smaller mobile units (commandos) and fought the British forces in a guerilla war. In response to this tactic, the Boer farms of both republics were destroyed, while black and white men, women and children still residing on the farms were taken to various concentration camps. Such a camp was also established at Vereeniging. The camp was located on

DATE	DESCRIPTION
	the farm Maccauvlei and was divided into a camp for the Boers and another camp for black people. The Boer camp in turn was divided between the Boer concentration camp (for prisoners-of-war, women, and children) and a camp which housed Boers who had surrendered and joined the British forces as part of a Burgher Corps (Leigh, 1968). With time the Boer forces and their leaders started considering negotiating for peace. Sammy Marks offered the opposing sides a site for these negotiations at the Central Mine. Different tented camps were erected for the different participants, such as the Z.A.R leadership, Orange Free State republic leadership and the British leadership. The representatives for the Boer republics were President Steyn of the Orange Free State, as well as Generals Botha, Smuts, Hertzog, De La Rey and De Wet. The British were represented by Lords Milner and Kitchener. The negotiations undertaken here resulted in the eventual signing of the Peace Treaty of Vereeniging at Melrose House, Pretoria on Saturday, 31 May 1902 (Leigh, 1968).
1904	On 17 August 1904, the Milner Government conferred municipal status on Vereeniging (Prins 2005).
1912	In 1912 the status of the major municipality was conferred on Vereeniging and Leslie was elected mayor (Prins 2005).
1934 - 1938	The construction of the Vaal Dam was undertaken jointly by Rand Water and the Department of Irrigation. Construction commenced in 1934 and the dam aimed to address the rapidly increasing need for water of the population of the Witwatersrand. The dam wall was completed in 1938 with a wall height of 54.2 m above the lowest foundation and a full supply capacity of 994 million m3. In the early 1950s, the wall was raised to 60.3m resulting in a capacity of 2 188 million m3. In 1985 the wall was raised to a height of 63.4m above the lowest foundation. This increased the capacity of the dam to 2 536 million m3 (Birkholtz 2009).

4.2.1 Historic Overview of Study Area and Surrounding Landscape

Stone Age

Archaeological investigations in the Vereeniging-Meyerton (which is located approximately 10km/20km northeast of the Project Site) area date to the late 1930's when C. van Riet Lowe investigated the occurrence of archaeological materials stratified within the Vaal River Gravel sequence. This led to the discovery of several sites near Vereeniging (approximately 10km northeast of the Project Site) and Meyerton (approximately 20km northeast of the Project Site), which preserved Large Cutting tools (LCTs) from the Acheulean Industry (Fourie 2017). This established an ESA sequence that is collectively known as the 'Three Rivers Sites' or the 'Vereeniging Sites' which include Klip River Quarry, Henley-on-Klip, Badfontein and the Meyerton Townlands (Fourie 2017).

The ‘type site’ of the Vaal River Gravel sequence, for the Vereeniging sites mentioned above, is the Klip River Quarry, discovered by C. van Riet Lowe (1937). The gravel sequence of this area comprises rocks of shales and sandstones from the Karoo Supergroup with diabase intrusions (dolerites and andesites). The latter rock types are the major stone tool materials utilized in Acheulean assemblages. Characteristic Acheulean LCTs were discovered, including handaxes and cleavers, yet detailed descriptions of this assemblage have not been provided. The Klip River quarry site was proclaimed as a National Monument (also a Provincial Heritage Site).

Another site like the Klip River Quarry is the Duncanville Archaeological Reserve. Duncanville was proclaimed a National Monument in 1944 (Oberholster, 1972). In terms of the NHRA the site is now protected as a Provincial Heritage Site. This site was proclaimed due to the large number of stone implements dating to the Acheulian period of the Early Stone Age which was discovered on the surface of the Vaal River gravel beds.

Both above-proclaimed sites were initially discovered by T. N. Leslie, an engineer, and later investigated by Van Riet Lowe, who was instrumental in them being declared National Monuments. These two sites were also excavated by Revil Mason between 1960/61 (Prins, 2005).

A further known site in the nearby area is the Meyerton Townlands site, which was briefly reported by le Roux and le Roux in 1959 (Fourie 2017). Trenches excavated by the Rand Water Board exposed gravels associated with the Klip River from which over 100 artefacts made on quartzite were collected. LCTs were produced through bipolar and large-flaking techniques, like other assemblages from the Vereeniging Sites (Fourie 2017).

Iron Age

Evidence of the Late Iron Age (1500-1800 AD) is prevalent in the Suikerboschrand and Klipriviersberg areas. Stone kraals and remnants of stone dwellings of the Sotho-Tswana peoples have been found. Other Late Iron Age stone-walled sites, dating from the 18th and 19th centuries, occur towards Alberton, along the rocky ridges of the eastern part of the Klipriviersberg (Huffman, 2000).

Iron Age sites have been identified in an AIA produced by Huffman (2008) for the Mountain View development on Farm Nooitgedacht 176 IR, Gauteng. Stonewalling and ceramic residues were identified at several localities near Perdeberg Hill, located on Farm Nooitgedacht. Some ceramics were associated with the “Uitkomst facies” (AD 1800) and were of high significance (Fourie 2017).

Redan Rock Engraving Site (Provincial Heritage Site)

Most of the details for the Redan engraving site (located approximately 12km northeast of the Project Site) were obtained from a thesis on the site written by Marguerite Prins (2005). Prins notes that the rock engraving site of Redan is believed to date to the Late Iron Age. In 1891 T.N. Leslie, an emigrant from England who was employed by Marks settled on the farm Leeuwkuil and opened the Wildebeest Quarry in the area close to the confluence of the Klip River and the Vaal River. While excavating for building stone, he discovered that the area was exceptionally rich in fossil plants, Early Stone Age tools and rock engraving sites. He discovered that rock engravings occurred on both the farms Klipplaatdrift and Leeuwkuil as well as on the farm Kookfontein. However, the inclusion of Klipplaatdrift and Leeuwkuil in the town of Vereeniging subsequently destroyed those sites. The engravings on Kookfontein were saved only because the farm was excluded from the plans for the new town (Prins 2005).

The rock engravings at Kookfontein were temporarily in the news in 1936 when the Klip Power Station was erected by ESCOM on a portion of the farm Waldrift No. 599, very close to the rock engraving site on the adjoining farm Kookfontein (Prins 2005). These two farms, bought originally in 1888 by Donald McKay, were both coal-bearing, and coal mining was conducted at the Meyerton Colliery on Kookfontein. To supply sufficient fuel to the Klip Power Station McKay Estates entered a contract with Amalgamated Collieries and Springfield Colliery was established at Kookfontein some distance away from the engraving site (Prins 2005: 49-50).

A small settlement and a post office were subsequently established on Waldrift. The closest railway station was Redan, and the settlement adopted the name Redan. The adjoining rock engraving site at Kookfontein also became known as the Redan rock engraving site (Prins 2005). Prins (2005) notes that Van Riet Lowe published the first systematic index of rock art sites, Prehistoric Art in South Africa in 1941, which included the farm Kookfontein No. 187 among four sites in the Vereeniging area.

The engraving site of Redan was researched by A.R. Willcox and H.L. Pager in 1967. Willcox and Pager copied all the petroglyphs by drawing them to scale and recorded a total of 244 petroglyphs, the majority of which comprised geometrical designs. Besides the petroglyphs, Willcox and Pager also documented 21 flattened or smoothed surfaces produced by rubbing or grinding activities. Willcox and Pager considered that the weathering of the surfaces of the petroglyphs suggested an estimated age of between 500 and 100 years; they were therefore probably made by the San people (Kovacs, 1998:10). The detailed analysis of the Redan site by Prins (2005) supports the view that suggests a relatively recent date for the engravings at Redan of within the last several hundred years, and probable association with Korana-Khoekhoe groups who were known to be present on the southern Highveld in the early 1800s (Prins 2005:264).

In terms of the NHRA this site is now a formally protected Provincial Heritage Site. It was previously declared a National Monument in 1971 (Prins 2005; SAHRIS). However, after 1994, and the replacement of the Vereeniging Town Council with the Lekoa Vaal Metropolitan Council, the farm Kookfontein that had been owned and managed by the Town Council and on which Redan is situated, was sold to a private individual, K. Badenhorst. According to the most recent information, portion 29 of Kookfontein 545 IQ is now owned by a brickwork company, Ocon Brick Pty Ltd. The local community is very aware of the site, and it has been recently highlighted by the local press regarding the proposed coal mining project (Vaal Weekblad, 27 February 2020).

Fossilised Forest

Prins notes that in addition to the archaeological sites discovered by Leslie, he also discovered the remains of a fossilised forest on the exposed bed of the Vaal River, in 1906 when he built a weir to dam the river to stabilise the water supply to the coal mine and other industries, This fossilised forest was later completely submerged when the Vaal River Barrage was built in 1923 by the Rand Water Board (Prins 2005: 42-43).

The towns of Vereeniging and Meyerton were both established in 1891. Meyerton was named after Johannes Petrus Meyer, a field cornet and member of the Transvaal Volksraad. By 1902 Kliprivierwas proclaimed as a district, but by 1910 the area formed part of the Heidelberg district. In 1925 Vereeniging became a separate district, including the former district of Kliprivier (Bergh 1999: 21-24).

Anglo-Boer War

The Anglo-Boer War was the greatest conflict that had taken place in South Africa up to date. To fortify their strongholds, the British built around 441 blockhouses and trenches at strategic points across the landscape. Today numerous blockhouses can still be seen including the remains of the British ‘Witkop Blockhouse’ next to the railroad link between Kliprivier and Daleside (Huffman, 2008) During the time of the Anglo-Boer War, an important event occurred at Vereeniging, which is located some distance from the study area. Peace talks between the Boers and the British started around April 1902 and culminated in the Peace of Vereeniging treaty on 31 May 1902. This event signalled the end of the Anglo-Boer War, as well as the end of the Boer Republics’ independence. (Bergh 1999: 251).

4.2.2 Archival and Historical Maps

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

Historical topographic maps (1:50 000) for various years (1941, 1954 and 1979) were available for utilisation in the background study. These maps were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The Project Site was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could be older than 60 years and thus protected under Sections 34 and 36 of the NHRA.

4.2.2.1 Krugersdorp Imperial Map, 1900 – 1919 and Kroonstad Imperial Map, 1900 – 1919

(University of Cape Town Libraries, South Africa)

The map depicted in **Figure 43** and **Figure 44** below is titled “Krugersdorp”. It was compiled by John Wood for the Field Intelligence Department. The map dates from 1900. On it, it is indicated two farms that form part of the current Project Site (Rietkuil and Rietspruit) although these are not all the farms that form part of the Project Site. The two farms that are also part of the area are Aspersie and Louisrus which could have been later editions.

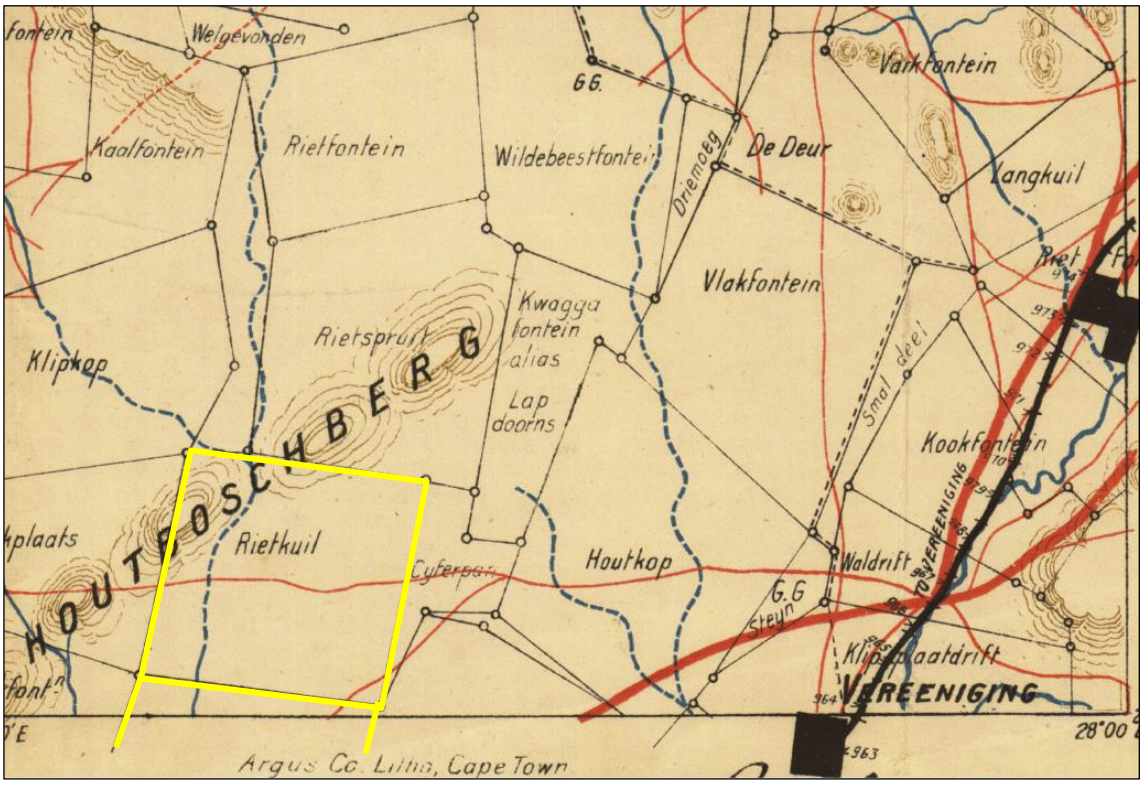


Figure 43 - Section of the 1900 Krugersdorp map highlighting the names of the farms (Rietkuil and a section of Rietspruit) where a portion of the Project Site is located (yellow polygon) (University of Cape Town Libraries, South Africa).

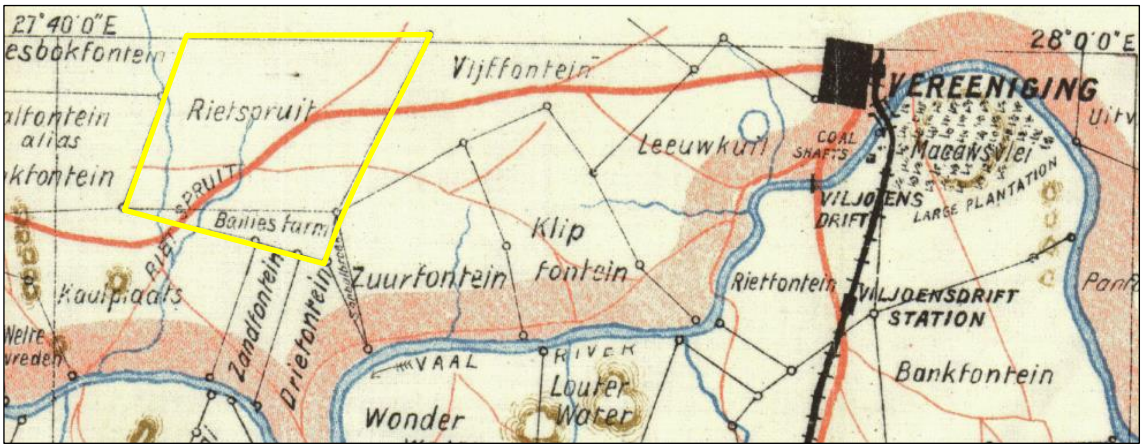


Figure 44 - Section of the 1900 Kroonstad map highlighting the names of the farm (Rietspruit) where a portion of the Project Site is located (yellow polygon) (University of Cape Town Libraries, South Africa).

4.2.2.2 The First Edition of the 2627DB Vereeniging Topographical Map dated 1941

The 2627DB Vereeniging Topographical Map was utilised to create an image overlay of the proposed Project Site (**Figure 45**). This map sheet shows a few heritage features within the proposed Project Site, which include huts, kraals, structures, and trigonometric beacons.

Overlays of the Project Site over this map sheet are provided in the image below. The following observations can be made from this overlay:

- The non-perennial rivers/streams.
- Large areas of cultivated land.
- Windbreaks and avenues.
- Forests.
- Plantations.
- National roads, other roads, and footpaths.
- Railway lines.
- Windpumps.
- Heritage features include huts, kraals, structures, and trigonometric beacons.

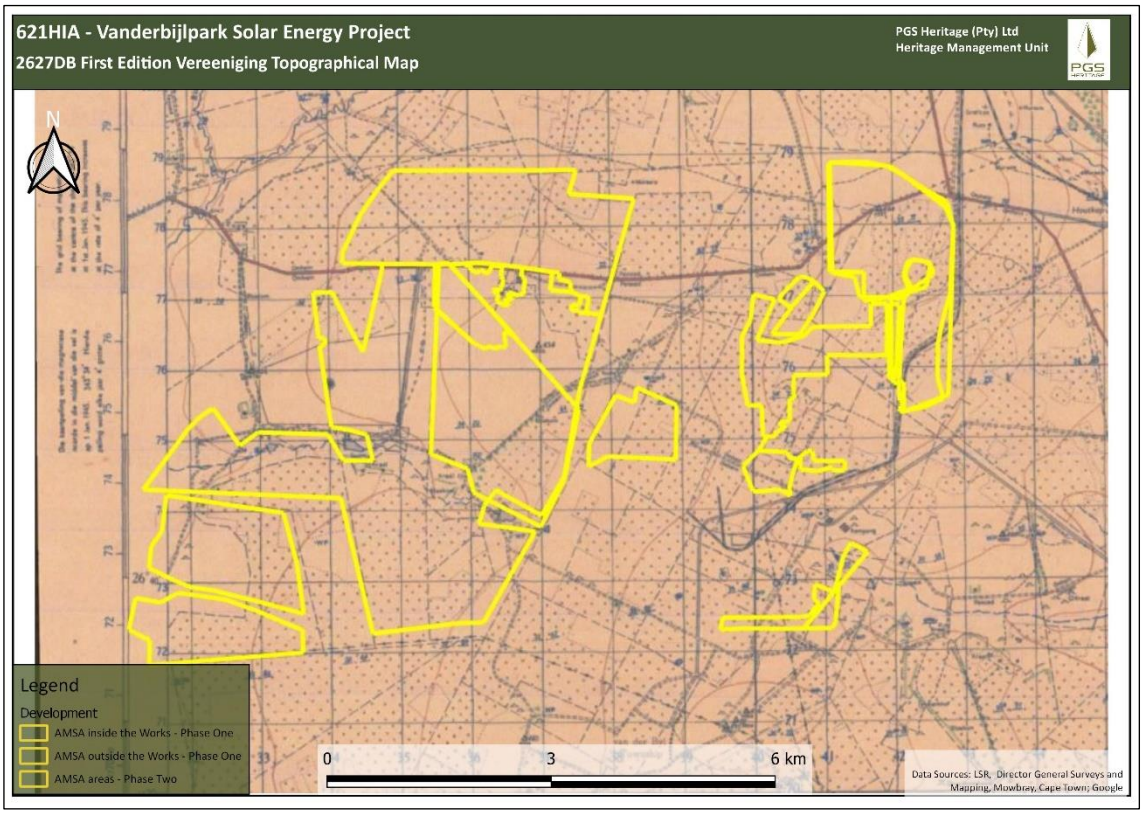


Figure 45 - Section of the first edition 2627DB Vereeniging Topographical Map highlighting the Project Site (yellow polygone).

4.2.2.3 The Second Edition of the 2627DB Vereeniging Topographical Map dated 1954

The 2627DB Vereeniging Topographical Map was utilised to create an image overlay of the proposed Project Site (**Figure 46**). This map sheet shows a few heritage features within the proposed Project Site, which include huts, kraals, ruins, structures, and trigonometric beacons.

Overlays of the Project Site over this map sheet are provided in the image below. The following observations can be made from this overlay:

- The non-perennial rivers/streams.
- Large areas of cultivated land.
- Windbreaks and avenues.
- Forests.
- Plantations.
- National roads, other roads, and footpaths.
- Railway lines.
- Powerlines.
- Telephone/Telegraph lines.

- Excavations.
- Anti-erosion walls.
- Windpumps.
- Heritage features include huts, kraals, ruins, structures, and trigonometric beacons.

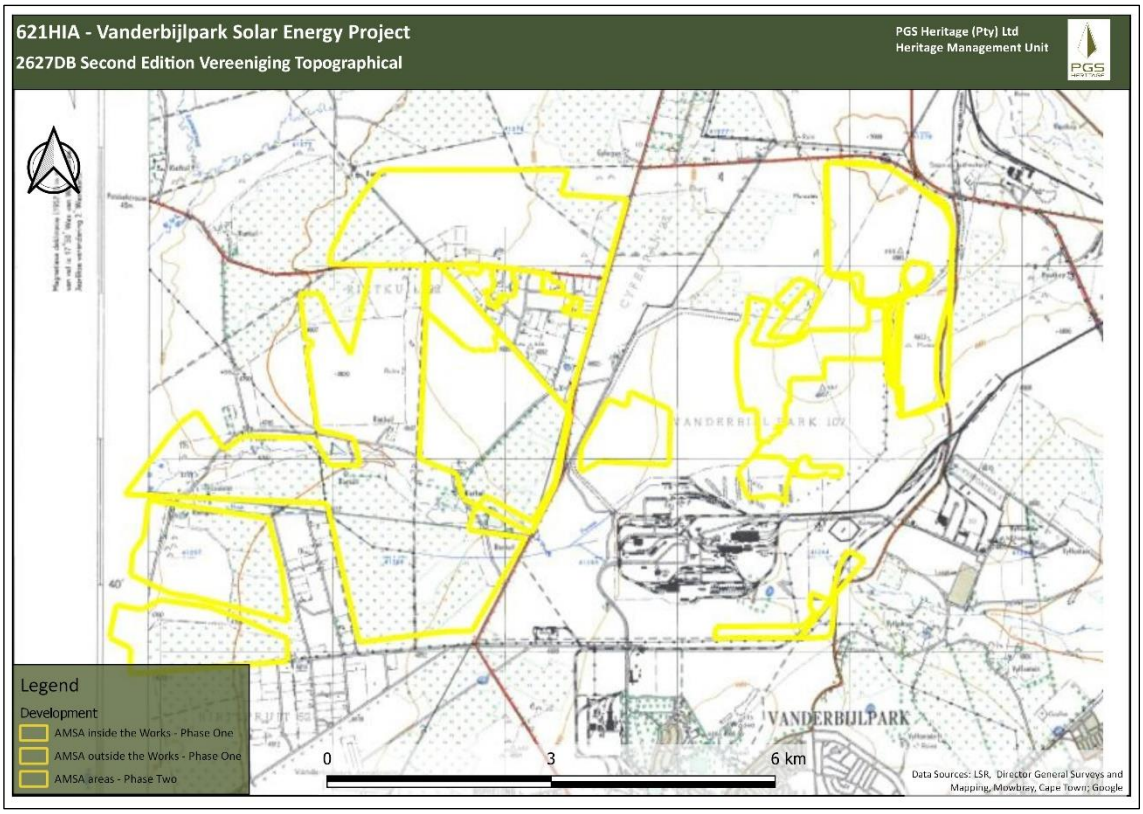


Figure 46 - Section of the second edition 2627DB Vereeniging Topographical Map highlighting the Project Site (yellow polygone).

4.2.2.4 The Third Edition of the 2627DB Vereeniging Topographical Map dated 1979

The 2627DB Vereeniging Topographical Map was utilised to create an image overlay of the proposed Project Site (**Figure 47**). This map sheet shows a few heritage features within the proposed Project Site, which include huts, kraals, ruins, structures, and trigonometric beacons.

Overlays of the Project Site over this map sheet are provided in the image below. The following observations can be made from this overlay:

- The non-perennial rivers/streams.
- Large areas of cultivated land.
- Windbreaks and avenues.
- Forests.

- Plantations.
- National roads, other roads, and footpaths.
- Railway lines.
- Powerlines.
- Telephone/Telegraph lines.
- Excavations.
- Anti-erosion walls.
- Windpumps.
- Heritage features include huts, kraals, ruins, structures, and trigonometric beacons.

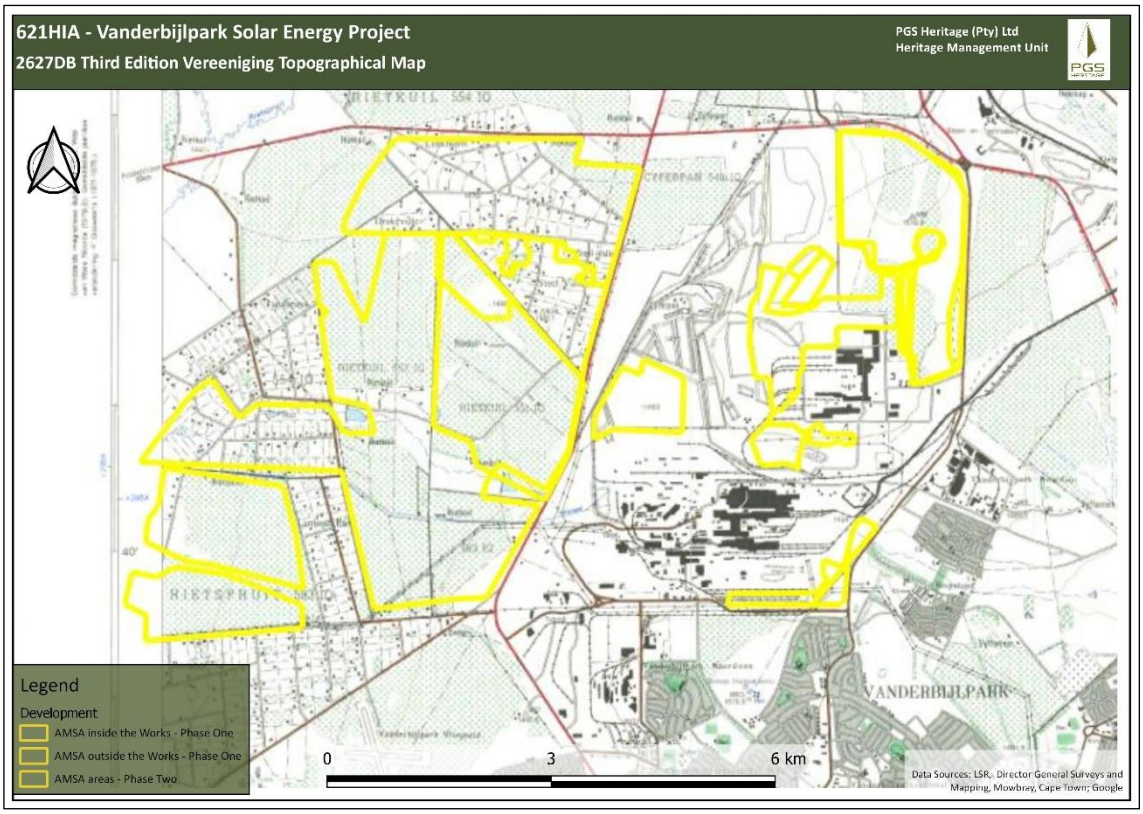


Figure 47 - Section of the third edition 2627DB Vereeniging Topographical Map highlighting the Project Site (yellow polygone).

4.2.3 Previous Heritage Impact Assessment Reports from the Project Site and Surroundings

A search of the South African Heritage Resources Information System (SAHRIS) database revealed that several previous archaeological and heritage impact assessments had been undertaken within the surroundings of the Project Site. In each case, the results of each study are shown in bold. These previous studies are listed below in ascending chronological order:

- Pistorius, J. J. 2007. A Phase I Heritage Impact Assessment Study for Water and Sewage Pipeline Corridors near Vanderbijlpark in the Gauteng Province of South Africa. **The fieldwork resulted in the identification of a few archaeological and heritage sites. These identified sites comprise the following: the sites identified were burial grounds and graves, as well as historic houses and structures.**

- Coetzee, F. P. 2008. Cultural Heritage Survey of the Proposed Development of Portion 53 of the Farm Kookfontein 545-IQ, Rothdene, Midvaal Local Municipality. For Triviron EAP. **No heritage resources were identified during the heritage survey.**

- Fourie, W. 2008. Heritage Scoping Report: Proposed development on Portion 28 of Rietspruit 583 IQ Vanderbijlpark, Gauteng Province. **The fieldwork resulted in the identification of 1 archaeological and heritage site. The identified site comprises the following: one (1) site identified as a historical farmstead.**

- Pelser A. J. & van Vollenhoven A. C. 2009. A Report on a Heritage Impact Assessment Study for the Powerline from Glockner-Kookfontein Substations Vereeniging, Gauteng. **No heritage resources were identified during the heritage survey.**

- van Schalkwyk, J. 2009. Heritage impact survey report for the Proposed Development of a Light Industrial Facility, Vanderbijlpark Magisterial District, Gauteng. **No heritage resources were identified during the heritage survey.**

- Birkholtz, P, D. 2010. Proposed Development of New Sedimentation and Flocculation Tanks at the Vereeniging Pumping Station, Vereeniging, Gauteng. **The fieldwork resulted in the identification of 5 archaeological and heritage sites. These identified sites comprise the following: five (5) sites identified as a few sedimentation tanks.**

- Fourie, W. 2011. Heritage Impact Assessment: GL21009-RW-B19- B19 Pipeline – Lethabo Pump Station in the Free State Province to Vereeniging Pump Station in the Gauteng Province. **The fieldwork resulted in the identification of 2 archaeological and heritage sites. These identified sites comprise the following: two (2) sites identified as historical structures.**

- Pelser A. J 2011. A Report on a Heritage Walk Down Study for the Proposed New 275kv Powerline between the Glockner-Kookfontein Substations Vereeniging, Gauteng. For: Baagi Environmental Consultancy CC. **No heritage resources were identified during the heritage survey.**

- van Vollenhoven, A. C. 2011. A Report on a Phase 1 Heritage Impact Assessment (HIA) for the Proposed Sicelo Substation and Power Line in the Meyerton Area, Gauteng Province. **No heritage resources were identified during the heritage survey.**

- Birkholtz, P. D. 2012. Old Vereeniging Hospital: Proposed Development of the Property containing the Old Vereeniging Hospital, Emfuleni Local Municipality, Sedibeng District Municipality, Gauteng Province. **The fieldwork resulted in the identification of 22 archaeological and heritage sites. These identified sites comprise the following: twenty-two (22) sites identified as historical structures.**

- Pelser A. J. 2013. Basic Assessment Report for a Waste Management License Application, DMS Powders, Meyerton Portions 4 & 63 of Kookfontein 545IQ, Gauteng. For: Shangoni Management Services (Pty) Ltd. **No heritage resources were identified during the heritage survey.**

- Fourie, W. 2017a. Finding on Possible Exemption from a Heritage Impact Study: Mixed Use Development on Portion 81 of the Farm Rietfontein 364IQ, Meyerton, Gauteng Province. **The fieldwork resulted in the identification of 2 archaeological and heritage sites. These identified sites comprise the following: two (2) sites identified as ESA and MSA stone age sites.**

- Fourie, W. 2017b. Archaeological Impact Assessment for Meyerton Mall and Residential Development on Portion 64 of Portion 81 of the Farm Rietfontein 364IQ, Meyerton, Gauteng, Province. This report was a follow-up survey of the two areas identified in the previous study. **The fieldwork resulted in the identification of 13 archaeological and heritage sites. These identified sites comprise the following: thirteen (13) sites identified as MSA stone tools and a few LSA stone tools.**

- van der Walt, J. 2017.Heritage Impact Assessment for the Proposed Kedake Resources Fish Farm, Meyerton, Gauteng Province. **No heritage resources were identified during the heritage survey.**

- Hollman, J. C. 2020. Archaeological Impact Assessment Report on the Redan Engraving Site: Springfield Coal Mining Project Situated between Vereeniging and Meyerton, in the Sedibeng District Municipality, Gauteng Province. **The fieldwork resulted in the identification of 1 archaeological and heritage site. These identified sites comprise the following: one (1) site identified as an archaeological rock engraving site of Redan.**

- Fourie, W. 2022. HIA for Springfield Project: Springfield Mining Project is situated between Vereeniging and Meyerton, in the Sedibeng District Municipality, Gauteng Province. **The fieldwork resulted in the identification of 12 archaeological and heritage sites. These identified sites comprise the following: twelve (12) sites identified as informal burial grounds, a historical structure, and an archaeological rock engraving site of Redan.**

4.2.4 Heritage Screening

A heritage screening report was compiled using the Department of Forestry, Fisheries and Environmental Affairs (DFFE) National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. According to the heritage screening report, the Project Site has a Low Heritage Sensitivity (**Figure 48),** and a Very High, High, Medium and Low Palaeontology Sensitivity (**Figure 49**). The fieldwork has shown that some archaeological and heritage resources were present in the area and thus have a higher rating than the original screening rating. This is in part due to the low resolution of the available data that the screening data is based on.

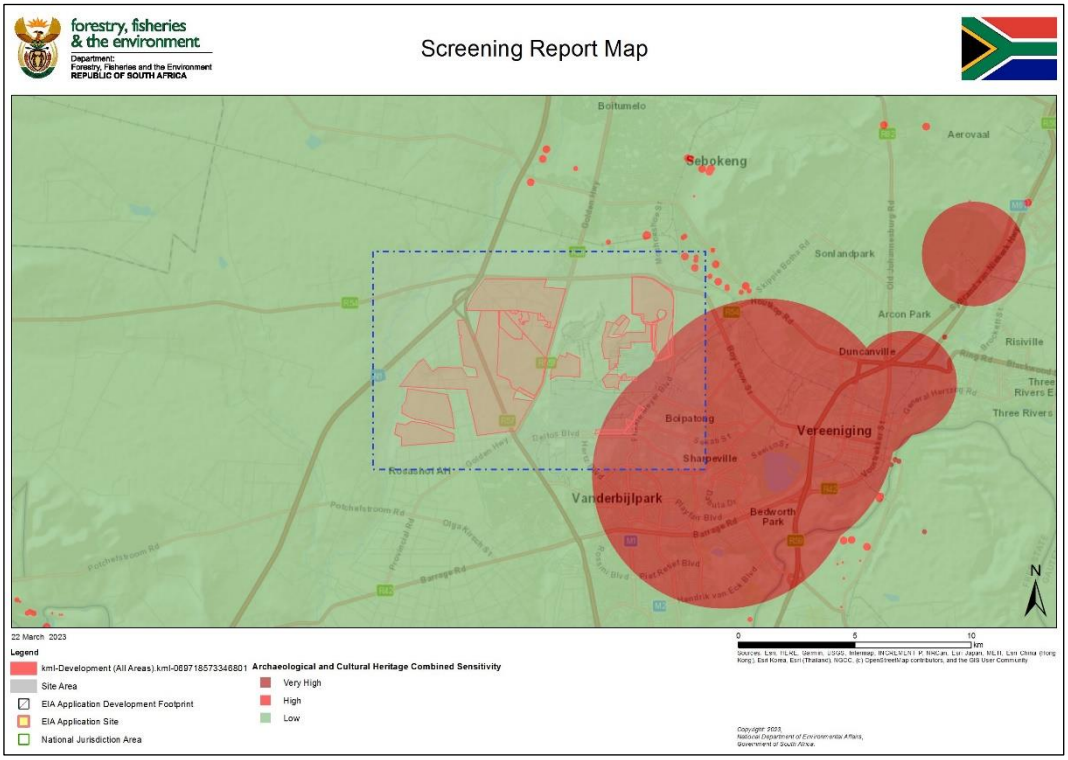


Figure 48 - Screening tool map indicating a low (green), high (red) and very high (dark red) sensitivity rating for archaeology and heritage in the proposed Project Site (Source: DFFE).

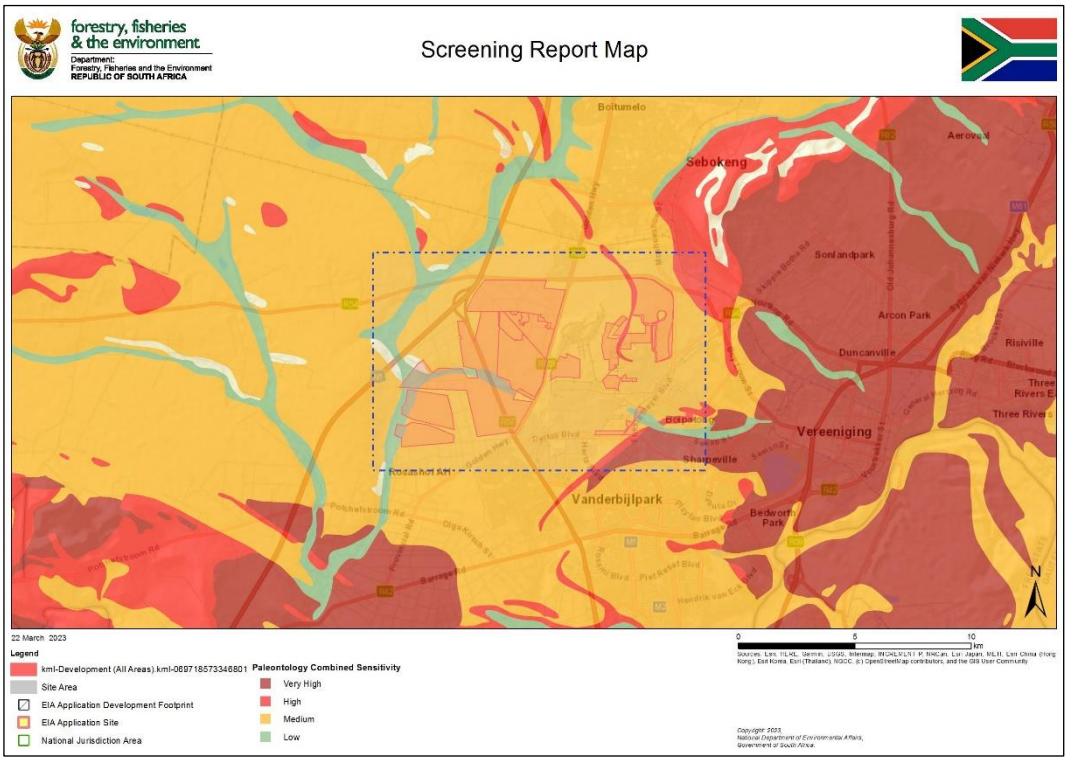


Figure 49 - Screening tool map indicating a low (green), medium (orange), high (red) and very high (dark red) sensitivity rating for palaeontology in the proposed Project Site (Source: DFFE).

4.2.5 Heritage Sensitivity

Analysis of maps and satellite imagery enabled the identification of possible heritage-sensitive areas. By superimposition and analysis, it was possible to rate these structures according to age and thus their level of protection under NHRA. **Table 4** lists the possible tangible heritage sites identified in the vicinity of the Project Site and the relevant legislative protection.

Table 4: Tangible heritage site in the study area.

Name	Description	Legislative protection
Archaeology	Older than 100 years	NHRA Sections 3 and 35
Structures	Possibly older than 60 years	NHRA Sections 3 and 34
Burial grounds	Graves	NHRA Sections 3 and 36 and MP Graves Act

Additionally, evaluation of satellite imagery has indicated the following areas that may be sensitive from a heritage perspective. Archaeological surveys and studies in the area have shown rocky outcrops, dry riverbeds, riverbanks, and confluence to be prime localities for archaeological finds and specifically Stone Age sites (Bergh, 1999; Oberholser, 1972; and Prins, 2005). The analysis of the studies conducted in the Project Site assisted in the development of the following landform type to heritage find matrix (**Table 5**).

Table 5: Landform type to heritage find matrix

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

4.3 Fieldwork Findings[1]

The first phase of the fieldwork was conducted from 13 – 15 September 2022, and the second phase was conducted on 2 March 2023, by a field team of PGS Heritage. Their movement on site was tracked by GPS and a tracklog map can be seen in **Figure 58**.

During the fieldwork, a total of fifteen (15) heritage features and resources were identified (**Figure 59).** These consist of seven (7) burial grounds with graves (**VDB01, VDB08, VDB09, VDB11, VDB12, VDB13** and **VDB14**) and seven (7) localities with recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15**), and one (1) trigonometrical beacon (**VDB02**). See the individual site descriptions as contained in **Appendix B**. The field description forms were collected with the ArcGIS Survey123 in field software.

Archaeological Resources

No archaeological sites were identified within the proposed Project Site.

Burial Ground and Graves

A total of seven (7) burial grounds consisting of approximately 150 graves in total were identified in various locations in the AMSA – 2, AMSA – 3 and AMSA – 5 areas.

One possible grave **VDB01** was identified in the AMSA – 2 area, which consists of a stone-packed feature. A total of eight graves were identified at the first burial ground **VDB08** (**Figure 50**), close to the recent structure **VDB07**, located within an old agricultural field. Some graves have marble headstones with concrete dressing whereas others have stone-packed dressing. The second burial ground **VDB09** (**Figure 51**) is located approximately 50m from the first burial ground **(VDB08)**. This is the largest burial ground located within the proposed Project Site, it contains approximately 60 graves. Due to the dense vegetation, it was problematic to identify all the graves in the area. The burial ground is also located within an old agricultural field. Most of the graves have stone-packed

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

dressing, with only a few graves with concrete or marble headstones. The third burial ground **VDB11** (**Figure 52**) is located next to the R57 nation road and contains approximately 15 graves. Some of the graves have stone-packed dressing and others concrete dressing, the headstones also consist of concrete. The fourth burial ground **VDB12** (**Figure 53**) contains only three graves which have concrete dressing. These three graves are also located close to the R57 national road and are located underneath existing powerlines. The following two burial grounds were identified during the second phase of the fieldwork. The fifth burial ground (**VDB13**) contains only two graves which are located approximately 40m south-west of the Project Site and are associated with the farmstead still located here. The last burial ground (**VDB14**) is located in an open field where cattle are grazing freely. The burial ground contains approximately 50 graves and the dressing on the graves range from stone-packed, to concrete dressing with some of the grave's headstones still intact (**Figure 54**). Due to the cultural and religious significance of burial grounds the site is graded as a Local High Significance (**Grade IIIA**).

Figure 50 – Burial Ground (VDB08) containing approximately 8 graves. Some of the graves have stone-packed dressing whereas others have concrete and marbled dressing. The graves are in the centre of an old agricultural field, next to a dirt road which is close to a recent structure identified as site VDB07.

Figure 51 - Burial Ground (VDB09) containing approximately 60 graves. Some of the graves have stone-packed dressing whereas others have concrete and marbled dressing. The graves are in the centre of an old agricultural field.

Figure 52 - Burial Ground (VDB011) containing approximately 15 graves. Some of the graves have stone-packed dressing whereas others have concrete and marbled dressing. The graves are located next to the R57 national road in an open field.

Figure 53 – Burial Ground (VDB12) containing approximately 3 graves, stone-packed and with concrete headstones. The graves are located underneath a powerline in an open field.

Figure 54 - Burial ground (VDB14) located within the AMSA – 5 area. Some of the graves have stone-packed dressing and other concrete dressing and headstones.

Historical Structures

The recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15**) identified in the AMSA – 3 areas are all younger than 60 years and vary in preservation. Some are abandoned and others are used as stored facilities or residential areas.

A round grey concrete reservoir **VDB03** was identified, which is currently empty. Two broken down and abandoned structures, **VDB05** and **VDB06** (**Figure 55**), were identified consisting of bricks and concrete, and other associated building rubble. A couple of large sheds or possible storage facilities **VDB07** were identified in the centre of the AMSA – 3 area, the shed is made up of corrugated iron materials and the structure is also surrounded by electric fencing. This structure is surrounded by large areas of agricultural fields and is currently in use. As mentioned earlier the north-eastern corner of the Project Site was once identified as a residential zone, and many ruins of structures are scattered across the area, only some of the buildings are still used as residential spaces. The areas where people are currently residing were not approached.

Two in-tact structures, **VDB04** (**Figure 56**) and **VDB10** were identified but appeared to be abandoned. The **VDB04** structure is identified as an old farmstead and consists of the main structure, a separate smaller structure which is located close to but not attached to the main structure. There is also a small square structure with a water tank (Jojo) on top of it. The main building is made up of bricks, concrete and a corrugated iron roof, and the windows are broken. The smaller separate structure is also made up of bricks which have been plastered with concrete, and the structure has a corrugated-iron roof. The structure doesn't have any windows, but only three different doors. The small square water tank structure appears to be empty and is made up of bricks and the green plastic Jojo tank on top of the structure. The **VDB10** structure identified is a large house made up of bricks, concrete, and a tiled roof. The windows and doors are still intact. The structure is surrounded by a fence and has a gate and a dirt road that leads up to the house. The structure also has a small 'stoep' and is surrounded by some trees which include palm trees. The **VDB15** structure which was identified during the second phase of the fieldwork is located close to the large burial ground VDB14. This structure is in ruins and consists of clay bricks with white concrete plaster over the walls.

The structure and remains of structures are not conservation worthy and contain no cultural or scientific value and are consequently graded as not conservation worthy (NCW).

Of interest is the trigonometric beacon (number 566) in the area identified as AMSA – 1, **VDB02** (**Figure 57**), which consists of two grey concrete spheres, with the smaller one on top covered in white paint. This feature was identified on the second edition, 1954 topographical map and is older than 60 years. The site has a moderate heritage significance and is graded as **Grade IIIB**. Any alterations or removal of the beacon will require an S34 permit under the NHRA.

Figure 55 - Site VDB06 which is the remains of a broken-down structure. The building consists of bricks and concrete.

Figure 56 - Site VDB04, which is an intact but abandoned structure. The structure consists of brick, concrete, and a zinc roof. Apart from the main structure, there is another smaller structure as well as a small square structure with a water tank (Jojo) on top.

Figure 57 - Site VDB02 is a historical trigonometrical beacon (no 566). The beacon is located in a flat open field and consists of concrete and white paint.

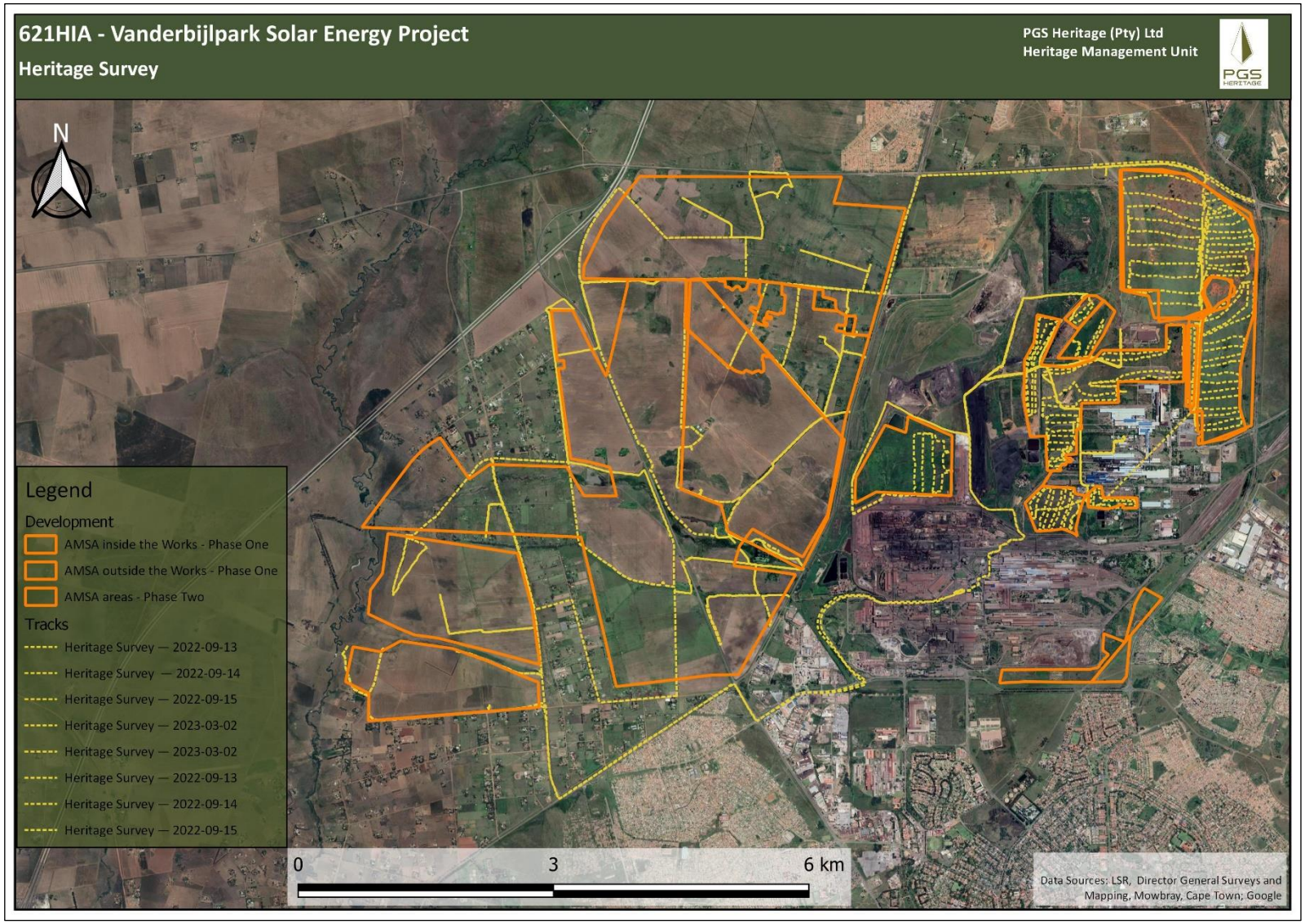


Figure 58 - Fieldwork tracklogs (tracks in yellow, and the Project Site in orange).

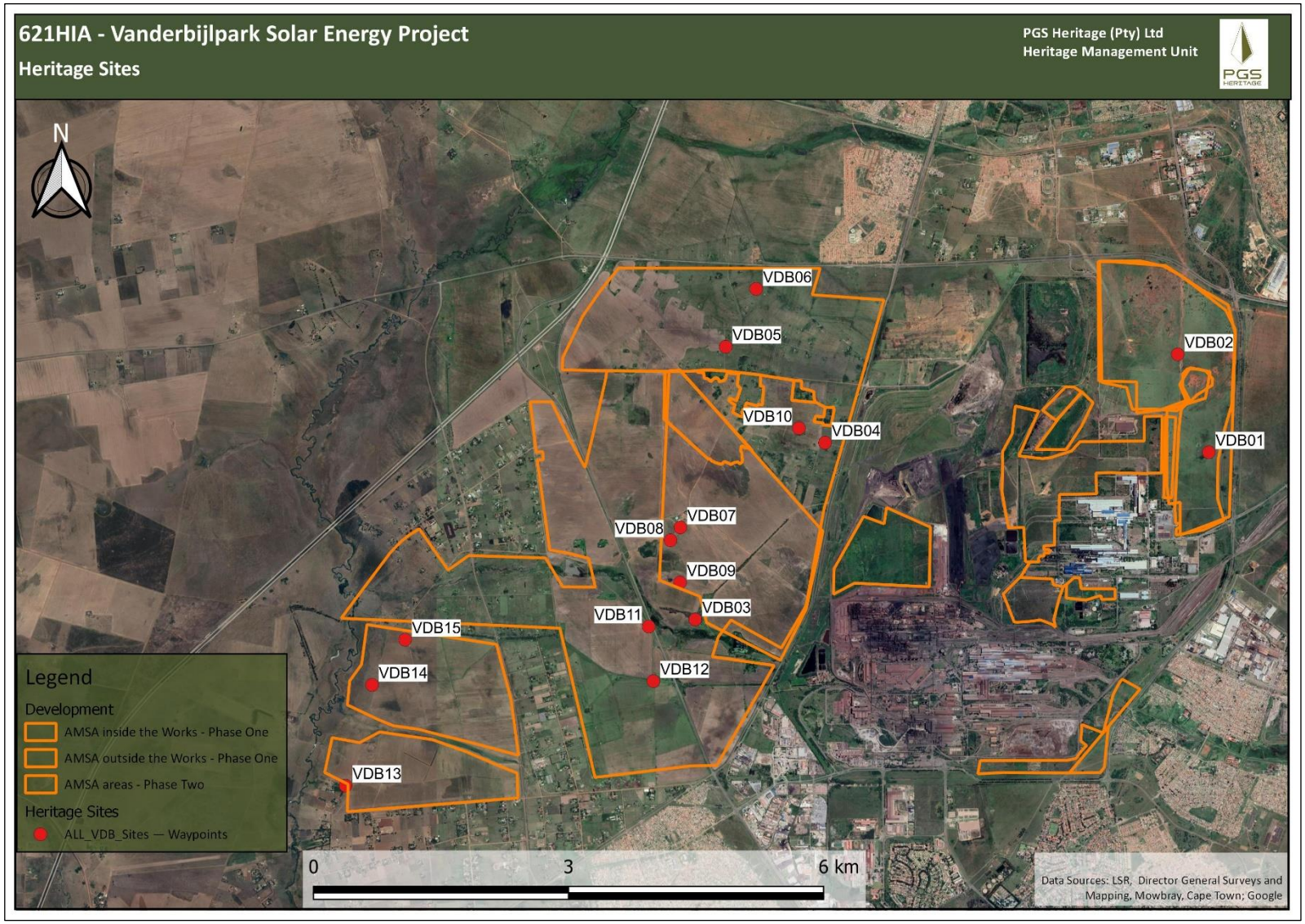


Figure 59 - Identified heritage resources (red dots) within the AMSA Solar Energy Project Site.

5 PALAEONTOLOGY

The geology of the proposed AMSA van der Bijl Park PV Project in Gauteng Province is indicated on the 1:250 000 West-Rand 2626 (1986) Geological Map (Council for Geosciences, Pretoria) (**Figure 60, Table 6**). The proposed development is largely underlain by Quaternary deposits (yellow single bird figure; Qs, light yellow; Qg, deep yellow) while a portion is underlain by the Vryheid Formation (Ecca Group, Karoo Supergroup). A small portion is in the west is underlain by diabase (Vdi, green), while a portion in the south-west (**Figure 60**) is underlain by the Daspoort Formation (Vd, purple with black dots) of the Pretoria Group [Transvaal Supergroup].

According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) (Error! Reference source not found.) the Palaeontological Sensitivity of the Quaternary alluvial deposits are Low (single bird figure) while the Quaternary Superficial deposits (Qs, Qg) has a Moderate Palaeontological Sensitivity and that of the Vryheid Formation is Very High. The Pretoria igneous intrusions (diabase, Vdi) have a Zero Palaeontological Sensitivity while that of the Daspoort Formation is High. The geology has recently been updated (Council of Geosciences, Pretoria) and is indicated in **Figure 62**. This map shows that study area is largely underlain by Quaternary alluvium, colluvium, elluvium and gravel.

The Pretoria Group sedimentary rocks in and near the study area are extensively intruded, and locally metamorphosed, by sills of diabase (di, green in **Figure 60**). The diabase has no palaeontological significance. However, the existence of the diabase rocks would have had a thermal metamorphic effect on the Pretoria Group and would decrease the chance of fossil preservation.

The Quaternary Era is also known as the “Age of the Mammals” and is preserved on coastal plains (Langebaanweg), cave systems (Makapan), and river gravel terraces (Cornelia), as well as other basins. These deposits have been subdivided in six African Land Mammal Ages, namely Recent, Florisian, Cornelian, Makapanian, Langebaanian, and Namibian (MacRae 1999). Quaternary deposits best known in the Free State is the Florisbad and Cornelia localities. Fossils recovered from these sites include teeth and bones of mammals, fish, reptiles, freshwater mollusks, trace fossils, wood, rhizoliths and diatom floras (Groenewald and Groenewald 2014). Quaternary fossils are usually very rare but may also include mammalian teeth and bone, ostrich eggshells, tortoise remains, ostracods, diatoms, and reptilian skeletons, trace fossils include burrows, vertebrate tracks, rhizoliths as well as calcretised termitaria (termite heaps). Plant remains include foliage, pear, wood, pollens. Microfossils and vertebrate remains are often found in Quaternary deposits near water courses and drainage lines.

The superficial deposits (represented by yellow on the geological maps, Qs/Qc/Qd) are the youngest geological deposits formed during the most recent geological period (approximately 2.6

million years ago to present). Most of the superficial deposits are unconsolidated sediments and consist of clay, gravel, sand, silt, that form relatively thin, discontinuous patches of sediments or larger spreads onshore. These sediments comprise of channel, floodplain and stream deposits, talus gravels and glacial drift sediments. Quaternary deposits are very important because palaeoclimatic changes are reflected in the different geological formations (Hunter et al., 2006). During the climate fluctuations in the Quaternary Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Quaternary but states that climatic changes during the Quaternary, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the Quaternary were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth et al., 2004).

The Permian Vryheid Formation is internationally renowned for its coal deposits and is known for its rich assemblage of Glossopteris flora (**Figure 63**) which is the source vegetation for this formation. The depth of the Vryheid Formation in the main Karoo Basin may be up to 500 m near Vryheid and New Castle in Kwazulu-Natal (type-locality), where the basin was at its deepest. The Vryheid Formation thins from the north-eastern part of the basin and finally wedges out towards the west, southwest and south (Johnson 2009). This formation forms a part of the Middle Ecca (Kent 1980) and contains the largest coal reserves in South Africa.

The Vryheid Formation comprises mudrock, rhythmite, siltstone and fine- to coarse-grained sandstone (pebbly in places). The Formation contains up to five (mineable) coal seams. The different lithofacies are mainly arranged in upward-coarsening deltaic cycles (up to 80m thick in the southeast). Fining-upward fluvial cycles, of which up to six are present in the east, are typically sheet-like in geometry, although some form valley-fill deposits. They comprise coarse-grained to pebbly, immature sandstones - with an abrupt upward transition into fine-grained sediments and coal seams (Hancox and Götz, 2014). This formation is known to contain a rich assemblage of Glossopteris flora which is the source vegetation for the Vryheid Formation. Gymnospermous glossopterids dominated the peat and non-peat accumulating of Permian wetlands after continental deglaciation took place (Falcon, 1986c, Greb et al., 2006).

Recent palaeobotanical studies in the Vryheid Formation include that of Adenforff (2005), Bordy and Prefect (2008) and Prefect *et al.* (2008, 2009, 2010) and Prevec, (2011). Bamford (2011) described numerous plant fossils from this formation (e.g., *Azaniodendron fertile*, *Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Hirsutum* sp., *Scutum* sp., *Ottokaria* sp., *Estcourtia* sp., *Arberia* sp., *Lidgetonnia* sp., *Noeggerathiopsis* sp., *Podocarpidites* sp as well as more than 20 Glossopteris species.

Palynological studies have focused on the coal bearing successions of the Vryheid Formation and include articles by Aitken (1993, 1994, 1998), and Millsteed (1994, 1999), while recent studies were conducted by Götz and Ruckwied (2014).

To date no fossil vertebrates have been collected from the Vryheid formation. The occurrence of fossil insects is rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are abundantly found but the diversity is low. The mesosaurid reptile, *Mesosaurus* (**Figure 64**) has been found in the southern parts of the basin but may also be present in other areas of the Vryheid formation. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

The Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton of South Africa namely the Griqualand West Basin, Transvaal Basin, as well as the Kanye Basin in Botswana. The Griqualand West Basin can be subdivided into the Ghaap Plateau and Prieska sub basins. The geometry of the three basins is mostly stratiform with the exclusion of the volcanic precursor of the Kanye Basin and parts of the Griqualand West Basin. Extensive deformation has taken place in the south-western portion of the Griqualand West Basin. Rocks of the Transvaal Supergroup in the Transvaal Basin were intruded by the Bushveld Complex approximately 2060 million years ago. The Transvaal Supergroup overlays the Archaean basement as well as the Witwatersrand and Ventersdorp Supergroups. In the far western and Kanye Basins rocks belonging to the Kanye Formation and Gaborone Granite Suite is also overlain by the Transvaal Supergroup. The Precambrian Transvaal Supergroup is approximately 2550-2050 Ma years old (Bekker et al. 2008; Catuneanu et al 1999), (Late Archaean to Early Proterozoic) and is about 15 km thick. This Supergroup consists of sedimentary, volcanic and unmetamorphosed clastic rocks. The sandstone dominated Magaliesberg Formation (youngest formation of the Pretoria Group) overlies the mudrocks of the Silverton Formation, and in turn the Silverton Formation overlies the sandstone dominated Daspoort Formation.

The Daspoort Formation overlies the Strubenkop (Eriksson et al., 1993b). The Daspoort Formation is characterised by subordinate mudrocks and ironstones in the east of the basin (Button, 1973a), and mature quartz arenites. Erikson et al (1993b) also describes pebbly arenites, immature sandstones, conglomerates and mudrocks in this formation that reflects the beginning of a major marine transgression that deposited the Silverton and Magaliesberg Formations (Eriksson et al., 1995). Thin stromatolitic cherts and carbonates (top of formation) normally changes into a condensed, transgressive dolomite or chert and is finally covered by the Silverton Shales. The Silverton Formation is a lithologically varied, mudrock-dominated sequence that was deposited on an offshore shelf along the borders of the Kaapvaal Craton (Eriksson et al. 2002, 2009). Volcanic ash-rich intervals are common as well as minor beds of carbonate and chert. Sandstones become more regular in the upper part of the sequence and was deposited under shallower conditions. In

the eastern part of the Pretoria Basin, the Machadodorp Member lies in the middle of the Silverton Formation and is represented by a conspicuous interval of volcanic rocks (including agglomerates basaltic lavas as well as tuffs). The presence the volcanic pillow lavas and water-lain tuffs indicates that they were formed beneath the sea. The deep-water Silverton mudrocks were deposited in high sea levels and was followed by shallowing fluvial and deltaic sandstones in low sea levels of the overlying Magaliesberg Formation. The Hekpoort formation consists of Basaltic andesite and pyroclastic rocks and is volcanic in origin. In the south the basaltic andesitic lavas are more than 1100m thick thinning to 800m in the west and is less than 50m thinning in the north. Subaerial fissure eruptions are dominant, with local pyroclastic systems (Oberholzer, 1995). Small lacustrine shale deposits are present between recurrent hiatuses in volcanism. Button (1973a) suggested an uppermost, widespread palaeosol. The Pretoria Group is known for stromatolites and may also contain microfossils.

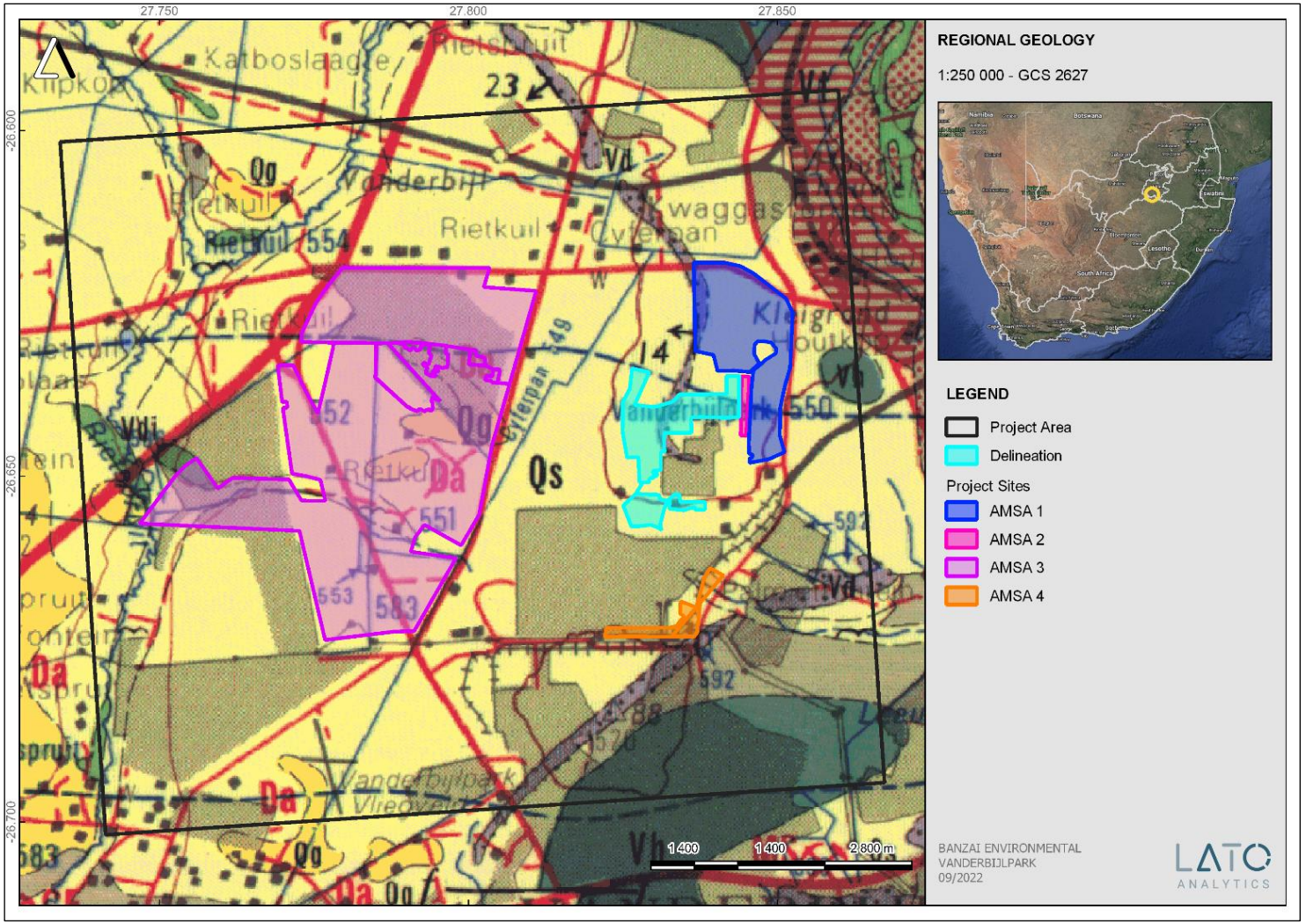
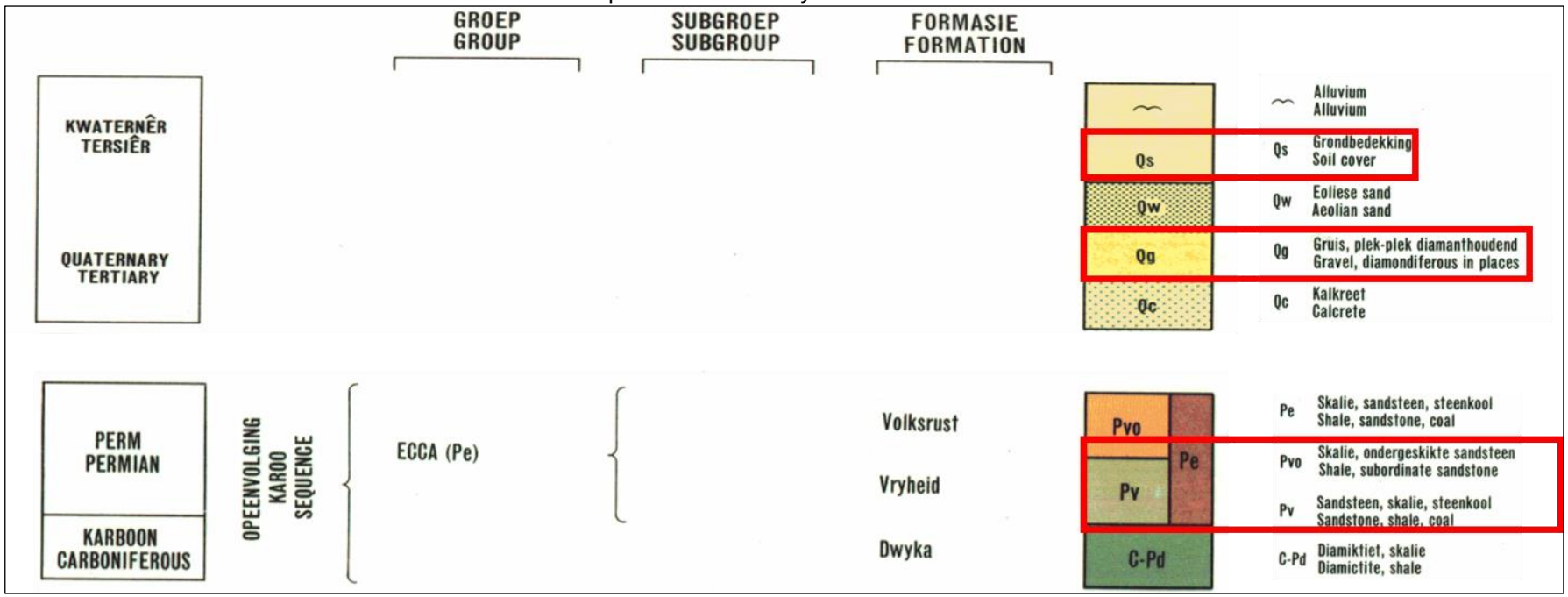
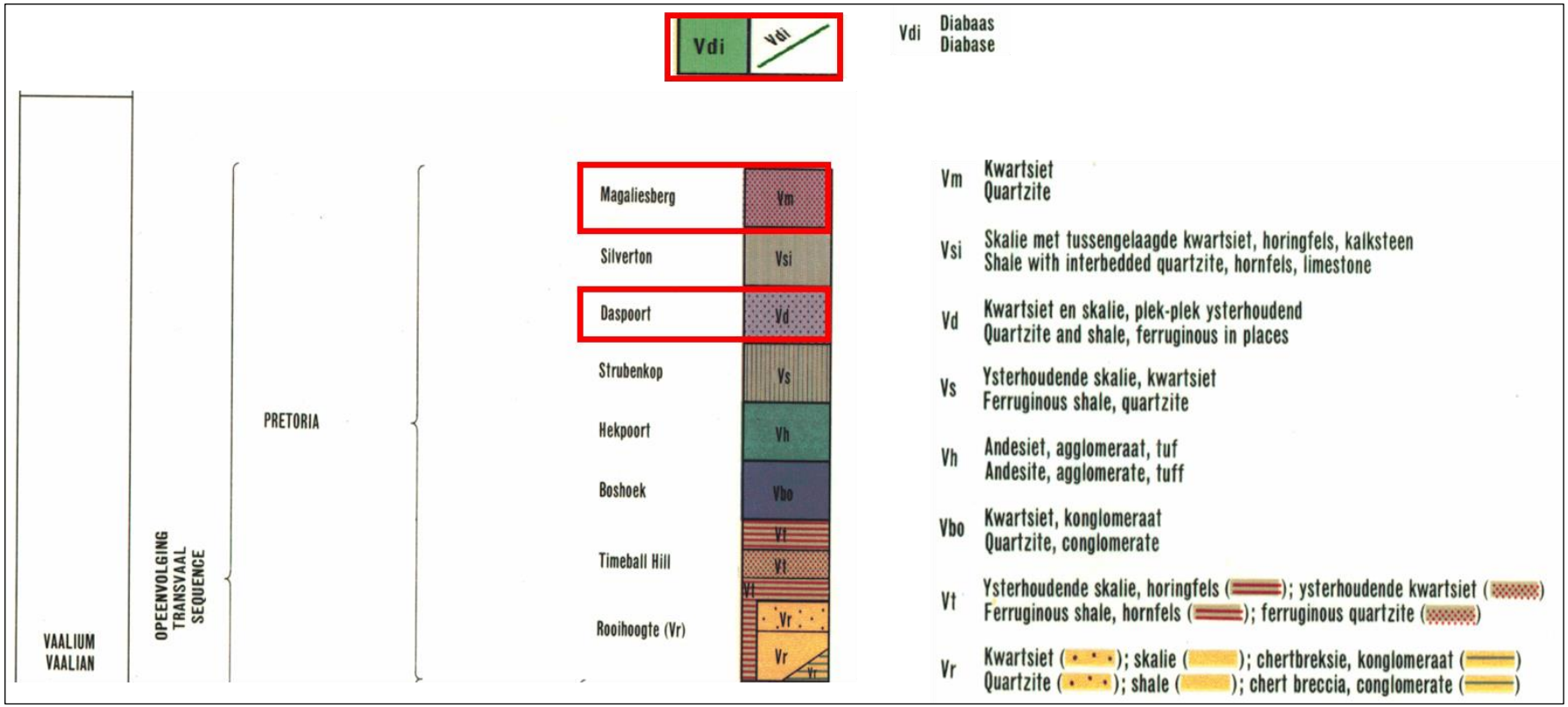


Figure 60 - Extract of the 1:250 000 West-Rand 2626 (1986) Geological Map (Council for Geosciences, Pretoria) indicating the proposed AMSA van der Bijl Park PV Project in Gauteng Province.

The proposed development is underlain by Quaternary deposits, the Vryheid Formation as well as diabase and rocks of the Pretoria Group (Transvaal Supergroup).

Table 6 - Legend of the 1:250 000 West-Rand 2626 (1986) Geological Map (Council for Geosciences, Pretoria)
Rock formations present in the study area is indicated in a red block




Vdi
Vdi
Diabaas
Diabase
VAALIUM
VAALIAN
OPEENVOLGING
TRANSVAAL
SEQUENCE
PRETORIA
Magaliesberg
Vm
Silverton
Vsi
Daspoort
Vd
Strubenkop
Vs
Hekpoort
Vh
Boshoek
Vbo
Timeball Hill
Vt
Rooihoogte (Vr)
Vr
Vm
Kwartsiet
Quartzite
Vsi
Skalie met tussengelaagde kwartsiet, horingfels, kalksteen
Shale with interbedded quartzite, hornfels, limestone
Vd
Kwartsiet en skalie, plek-plek ysterhoudend
Quartzite and shale, ferruginous in places
Vs
Ysterhoudende skalie, kwartsiet
Ferruginous shale, quartzite
Vh
Andesiet, agglomeraat, tuf
Andesite, agglomerate, tuff
Vbo
Kwartsiet, konglomeraat
Quartzite, conglomerate
Vt
Ysterhoudende skalie, horingfels ( ); ysterhoudende kwartsiet ( )
Ferruginous shale, hornfels ( ); ferruginous quartzite ( )
Vr
Kwartsiet ( ); skalie ( ); chertbreksie, konglomeraat ( )
Quartzite ( ); shale ( ); chert breccia, conglomerate ( )

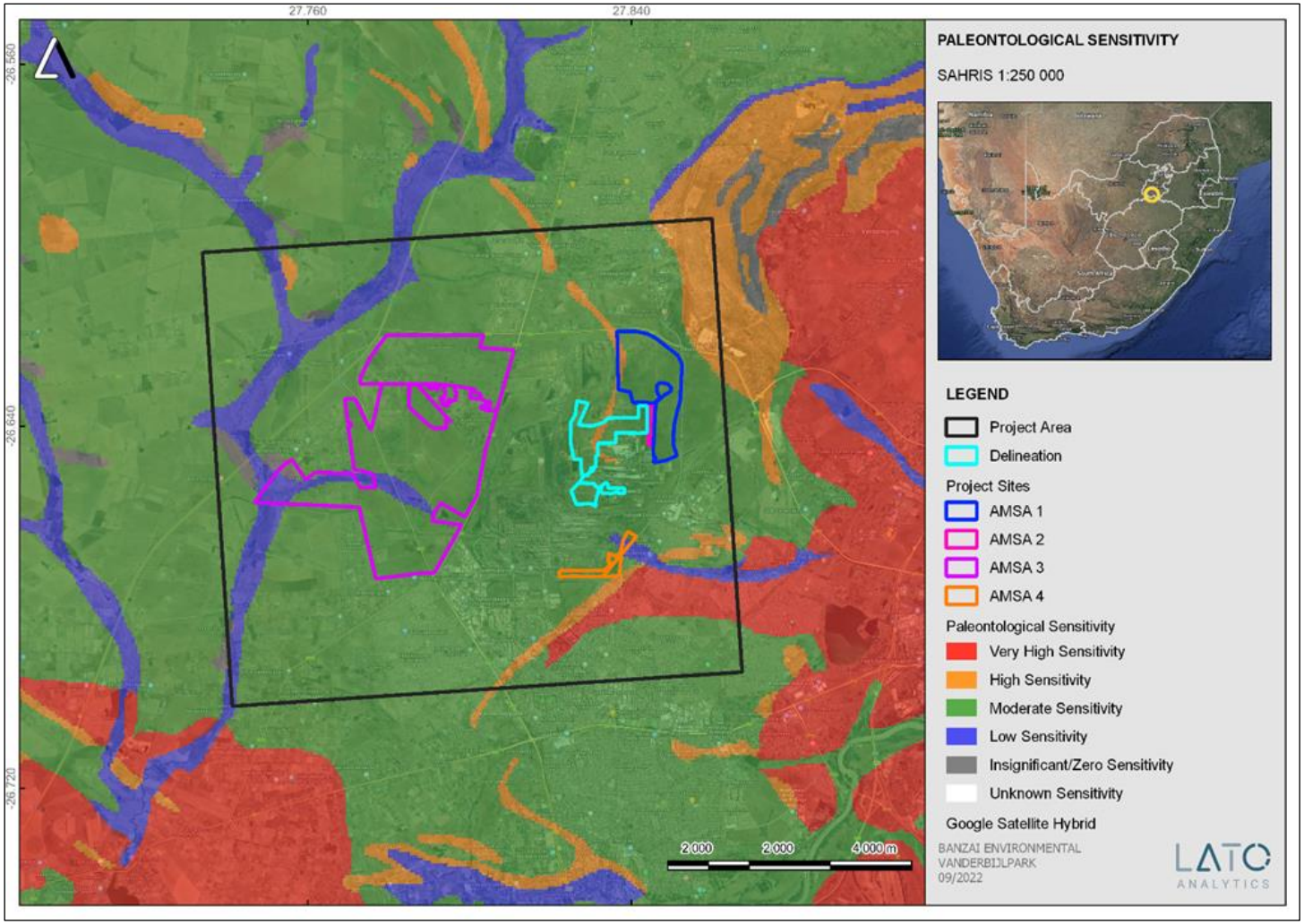


Figure 61 - Extract of the 1 in 250 000 SAHRIS Palaeo Map (Council of Geosciences) indicating the proposed AMSA van der Bijl Park PV Project in Gauteng Province.

Table 7 - Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website)

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

According to the SAHRIS Palaeosensitivity map (Error! Reference source not found.) the proposed development is underlain by sediments with a Very High (red), High (orange), moderate (green) and Low (blue) and Zero (grey) Palaeontological Sensitivity.

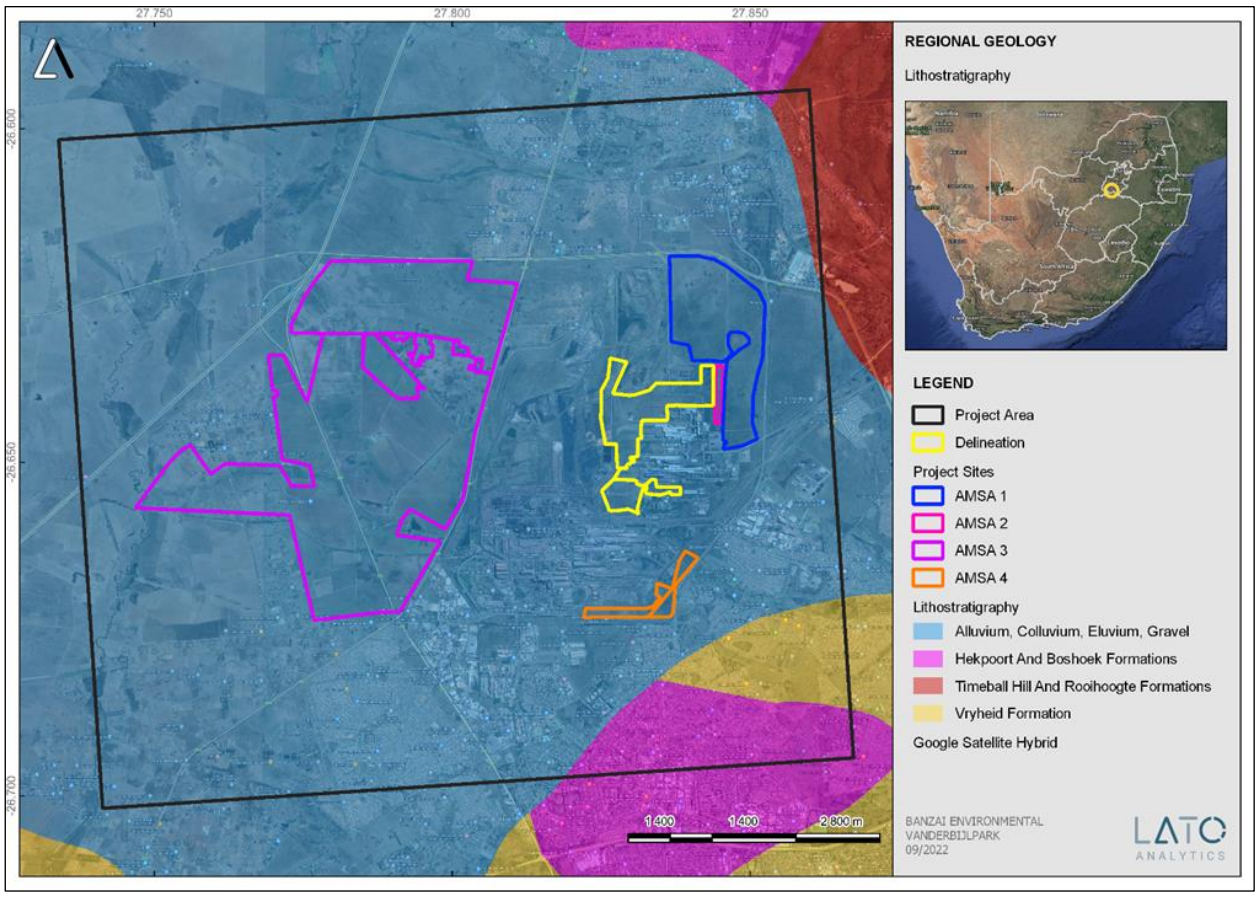


Figure 62 - Updated Geology (Council of Geosciences, Pretoria) of the proposed AMSA van der Bijl Park PV Project in Gauteng Province.

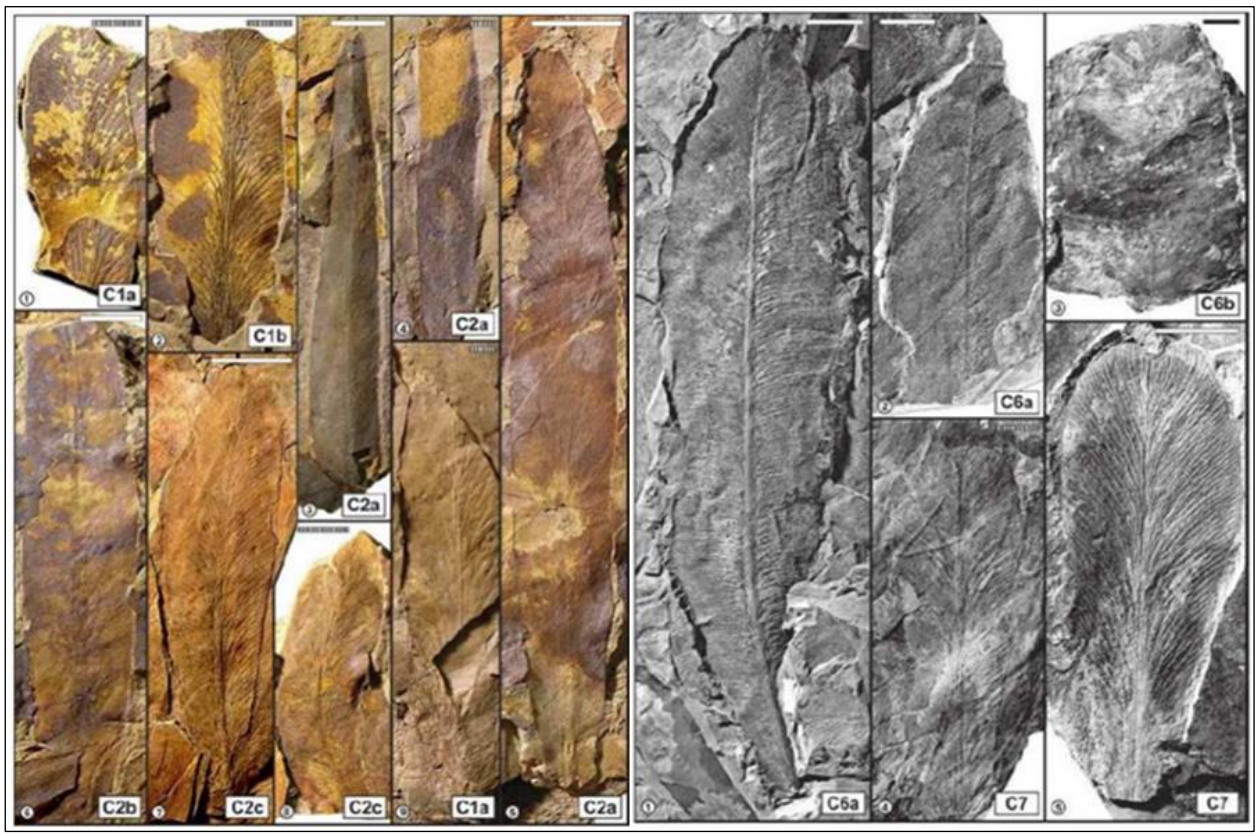


Figure 63 - Examples of Glossopteris leaves (Prevec et al 2009).

Figure 64 - Mesosaurus sp. National Museum specimen NMQR3536.

6 IMPACT ASSESSMENT

The impact assessment rating is based on the rating scale contained in **Appendix B**.

The following section provides an analysis of the impact of the proposed project area on heritage resources identified within the AMSA Solar Project Site.

6.1 Details of All Alternatives Considered

This section describes alternative means of carrying out the operation and the consequences of not proceeding with the proposed project.

The “no-go” alternative refers to the option of not going ahead with the proposed project. This will entail maintaining the current status quo with no impact on the project.

6.1.1 Archaeological Resources

The possibility of the archaeological resources impacted by the proposed Vanderbijlpark Solar Energy Project cannot be excluded and the project can potentially have a **LOW** impact without and with mitigation.

6.1.2 Burial Grounds and Graves

The burial grounds located at sites **VDB01, VDB08, VDB09, VDB11 VDB12, VDB13** and **VDB14** have a high local heritage significance with 3A heritage grading. The possibility of the burial ground being impacted by the proposed Vanderbijlpark Solar Energy Project cannot be excluded and the project can potentially have a **HIGH** impact without mitigation. Implementation of the recommended management and mitigation measures can reduce the impact rating to **LOW**.

6.1.3 Historical Structures

The impact on the recent historic structures located at sites **VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15** and the trigonometrical beacon (no. 566) located at site **VDB02** identified during the fieldwork is calculated as having a **LOW** significance before and after the implementation of the proposed mitigation measures.

6.1.4 Palaeontology

According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Quaternary alluvial deposits are Low, while the Quaternary Superficial deposits has a Moderate Palaeontological Sensitivity and that of the Vryheid Formation is Very High. The Pretoria igneous intrusions have a Zero Palaeontological Sensitivity

while that of the Daspoort Formation is High. Updated (Council of Geosciences, Pretoria) indicates that study area is largely underlain by Quaternary alluvium, colluvium, elluvium and gravel.

It is thus recommended that a phase 1 field-based assessment report be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the likely impacts.

6.2 Heritage Impacts and Impact Assessment Table

During the fieldwork, a total of fifteen (15) heritage features and resources were identified (**Figure 59).** These consist of seven (7) informal burial grounds with graves (**VDB01, VDB08, VDB09, VDB11,VDB12, VDB13** and **VDB14**) and seven (7) localities with recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07,VDB10** and **VDB15**), and one (1) trigonometrical beacon (**VDB02**).

6.2.1 Burial Grounds and Graves

The sites **VDB01, VDB08, VDB09, VDB11**, **VDB12, VDB13** and **VDB14** have a high heritage significance and heritage rating of IIIA. This site has **HIGH** heritage sensitivity.

The impact significance before mitigation on the graves will be **MODERATE** negative before mitigation. *The impact of the proposed development will be local in extent.* **The possibility of the impact occurring is probable**. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable **LOW** negative impact.

Table 8: Impact Assessment Table for Burial Grounds and Graves.

Graves and Burial Grounds have been identified during the survey. This site is of high significance and rated as IIIA.		
	Without mitigation	**With mitigation**
Extent	Moderate/High (4)	Low (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Low (2)
Probability	Probable (3)	Unlikely (2)
Significance	**High (68)**	**Low (14)**
Status (positive or negative)	Negative	Negative

Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: • The sites should be demarcated, and a 50-meter no-go-buffer zone must be enforced. The graves should be avoided and left in situ. • A Grave Management Plan should be developed for the graves, to be implemented during the construction and operation phases (which needs approval by SAHRA BGG). • If the site is going to be impacted directly and the graves need to be removed, a grave relocation process for these sites is recommended as a mitigation and management measure. This will involve the necessary social consultation and public participation process before grave relocation permits can be applied for with the SAHRA BGG under the NHRA and National Health Act regulations.		
Cumulative impacts: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact could lead to the irreplaceable loss of burial grounds and graves.		
Residual Impacts: Considering the nature of the sites identified in the present study, the residual risk will be moderate.		

6.2.2 Historical Structures

The sites **VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15** were rated as not conservation worthy and of no heritage significance.

The impact significance before mitigation on the structures will be **LOW** negative. *The impact of the proposed development will be local in extent*. **The possibility of the impact occurring is probable**. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable **LOW** negative impact.

Table 9: Impact Assessment Table for Historical Structures of no heritage significance.

Historical Structures have been identified during the survey. These sites were rated as not conservation worthy (NCW) and of no heritage significance.		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)

Duration	Long term (4)	Long Term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Probable (3)	Unlikely (2)
Significance	**Low (21)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: No mitigation is required		
Cumulative impacts: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. Therefore, no cumulative impact is expected to occur.		
Residual Impacts: Considering the nature of the sites identified in the present study, the residual risk will be minimal.		

6.2.3 Trigonometrical Beacon

The site **VDB02** was rated IIIB and has a moderate heritage significance.

The impact significance before mitigation on the structures will be **LOW** negative. *The impact of the proposed development will be local in extent*. **The possibility of the impact occurring is probable**. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable **LOW** negative impact.

Table 10: Impact Assessment Table for the Trigonometrical Beacon.

A trigonometrical beacon has been identified during the survey. This site is of moderate significance and rated as IIIB.		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Long term (4)	Long Term (4)
Magnitude	Minor (2)	Minor (1)

Probability	Probable (3)	Unlikely (2)
Significance	**Low (21)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Any alterations or removal of the beacon will require an S34 permit under the NHRA.		
Cumulative impacts: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. Therefore, no cumulative impact is expected to occur.		
Residual Impacts: Considering the nature of the sites identified in the present study, the residual risk will be minimal.		

6.2.4 Palaeontology

Table 11: Impact Assessment Table for Palaeontology

Nature: The excavations and clearing of vegetation during the construction phase of the AMSA Solar Project and associated infrastructure will consist of digging into the superficial sediment cover as well as underlying deeper bedrock. These excavations will change the existing topography and may possibly damage, destroy or even permanently close-in fossils at or below the surface of the ground. These fossils will then be lost for research. Impacts on Palaeontological Heritage are only likely to happen within **the construction phase**. No impacts are expected to occur during the operation phase or decommissioning phase.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term/permanent (5)	Long term/permanent (5)
Magnitude	High (8)	Moderate (2)
Probability	High (4)	Improbable (2)
Significance	**MEDIUM (56)**	**LOW (16)**
Status (positive or negative)	Negative	Neutral
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		

It is thus recommended that a phase 1 field-based assessment report be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the likely impacts.
Residual Risk: *Loss of Fossil Heritage*

6.3 Cumulative Impacts

This section evaluates the possible cumulative impacts on heritage resources with the addition of the Project. The cumulative impacts considered below assume that mitigation measures have been applied.

Table 12: Cumulative Impact Assessment Table for Burial Grounds and Graves.

Graves and Burial Grounds have been identified during the survey. These sites are of high significance and rated as IIIA. Cumulative impacts on Burial Grounds and Graves resources would occur during the construction and operation phases.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (3)
Probability	Unlikely (2)	Unlikely (2)
Significance	**Low (14)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then minimise them, rehabilitate or repair impacts to the extent feasible. Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact could lead to the irreplaceable loss of burial grounds and graves.		
Residual Impacts:		

"Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014). Considering the nature of the sites identified in the present study, the residual risk will be moderate.

Table 13: Cumulative Impact Assessment Table for Historical Structures of no heritage significance.

Historical Structures have been identified during the survey. These sites were rated as not conservation worthy and of no heritage significance. Cumulative impacts on historical resources would occur during the construction and operation phases.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Long term (4)	Long Term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Probable (3)	Unlikely (2)
Significance	**Low (21)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then minimise them, rehabilitate or repair impacts to the extent feasible. Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. Therefore, no cumulative impact is expected to occur.		
Residual Impacts: "Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014). Considering the nature of the sites identified in the present study, the residual risk will be minimal.		

Table 14: Cumulative Impact Assessment Table for the Trigonometrical Beacon.

A Trigonometrical Beacon has been identified during the survey. This site was rated as IIIB and of a moderate heritage significance. Cumulative impacts on historical resources would occur during the construction and operation phases.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Long term (4)	Long Term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Probable (3)	Unlikely (2)
Significance	**Low (21)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

"Mitigation", means to anticipate and prevent negative impacts and risks, then minimise them, rehabilitate or repair impacts to the extent feasible.

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. Therefore, no cumulative impact is expected to occur.

Residual Impacts:

"Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014).

Considering the nature of the sites identified in the present study, the residual risk will be minimal.

7 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

The following section must be read in conjunction with **Table 16** of this report.

7.1 Construction and Operational Phases

The project will encompass a range of activities during the construction phase, including ground clearance, the establishment of construction camp areas and small-scale infrastructure development associated with the Project.

It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction, and as such must be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, however, foundation holes do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project, and these must be catered for. Temporary infrastructure developments, such as construction camps and laydown areas, are often changed or added to the project as required. In general, these are low-impact developments as they are superficial, resulting in little alteration of the land surface, but they still, need to be catered for.

During the construction phase, it is important to recognise any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

7.2 Chance Finds Procedure

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

7.3 Possible Finds During Construction

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

- Historical structures and foundations;
- Unmarked burial grounds and graves;
- Archaeological objects.

7.4 Grave Management Plan Guidelines

The HIA identified burial grounds at **VDB01, VDB08, VDB09, VDB11, VDB12, VDB13** and **VDB14**. These sites will require management and mitigation if any of the resource will be affected by any construction-related activities. The following should be included as a minimum in the Grave Management Plan to be drafted for the BGG to be retained in situ in the Project Site:

- The plan must define how the site will be protected, i.e., fencing, gates, buffer distances from development activities;
- How access will be controlled for visitors and arrangements about visitation for the next of kin;
- How general up-keep of the burial ground will be done and must include such as aspects as vegetation control, and timing of activities.

7.4.1 Chance finds procedure

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

7.5 Timeframes

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

Table 15: Lead times for permitting and mobilisation

Action	Responsibility	Timeframe

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

7.6 Heritage Management Plan for EMPr Implementation

Table 16: Heritage Management Plan for EMPr implementation

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for the implementation	Monitoring Party (frequency)	Target	Performance indicators (Monitoring tool)
General project area	• Implement a chance to find procedures in case where possible heritage finds are uncovered. • A detailed "walk down" of the final approved Solar PV Energy Facility and the grid connection corridor will be required before construction commences. • Any heritage features of significance identified during this walk-down will require formal mitigation (i.e., permitting where required) or where possible a slight change in design could accommodate such resources. • A Heritage management plan (HMP) for the heritage resources needs to be compiled and approved for implementation during construction and operations where heritage features of significance are identified.	Construction	During construction	Applicant Environmental Control Officer (ECO) Heritage Specialist	ECO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Sections 34-36 and 38 of NHRA	ECO Monthly Checklist/Report
Historical Structures that were rated as NCW **(VDB03, VDB04, VDB05, VDB06, VDB07,**	• No mitigation is required	Construction	Before and during construction	Applicant ECO	Monthly	Ensure compliance with relevant legislation and recommendations from SAHRA under Sections 36 and 38 of NHRA	ECO Monthly Checklist/Report

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for the implementation	Monitoring Party (frequency)	Target	Performance indicators (Monitoring tool)
VDB10 and **VDB15)**							
Trigonometrical Beacon **(VDB02)**	• Any alterations or removal of the beacon will require an S34 permit under the NHRA.	Construction	Before and during construction	Applicant ECO Heritage specialist	Monthly	Ensure compliance with relevant legislation and recommendations from SAHRA under Sections 36 and 38 of NHRA	ECO Monthly Checklist/Report
Burial Grounds and Graves **(VDB01, VDB08, VDB09, VDB11, VDB12, VDB13** and **VDB14)**	• Demarcate sites with a 50-meter buffer as per SAHRA guidelines and avoid them. • A Grave Management Plan should be developed for the graves, to be implemented during the construction and operation phases (which needs approval by SAHRA BGG). • Stakeholder engagement will need to be implemented in the case where the graves are to be relocated. • If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations.	Construction	During construction	Applicant ECO Heritage specialist	Monthly	Ensure compliance with relevant legislation and recommendations from SAHRA under Sections 36 and 38 of NHRA	ECO Monthly Checklist/Report
Palaeontological Resources	If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Control Officer (ECO) in charge of these developments must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that	Construction	During construction	Applicant ECO	Monthly	Ensure compliance with relevant legislation and recommendations from SAHRA under Sections 36 and 38 of NHRA	ECO Monthly Checklist/Report

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for the implementation	Monitoring Party (frequency)	Target	Performance indicators (Monitoring tool)
	mitigation can be carried out by a palaeontologist. It is recommended that a Phase 1 field-based assessment report be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage.						

8 CONCLUSIONS AND RECOMMENDATIONS

The HIA identified various heritage resources within the Project Site including burial grounds and graves which are rated as having a **HIGH** heritage significance and will require further mitigation work before the Project can continue.

During the fieldwork, a total of fifteen (15) heritage features and resources were identified (**Figure 59**). These consist of seven (7) informal burial grounds with graves (**VDB01, VDB08, VDB09, VDB11, VDB12, VDB13** and **VDB14**) and seven (7) localities with recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15**), and one (1) trigonometrical beacon (**VDB02**). See the individual site descriptions as contained in **Appendix B**. The field description forms were collected with the ArcGIS Survey123 in field software.

8.1 Archaeological Resources

No evidence for any archaeological sites could be identified within the proposed Project Site.

8.2 Burial Grounds and Graves

Seven (7) different informal burial grounds with graves were identified during the survey. One possible grave (**VDB01**) was identified in an open field in the eastern portion (AMSA – 1) of the proposed Project Site. Two informal burial grounds (**VDB08** and **VDB09**) were identified in the middle of agricultural fields, and two informal burial grounds (**VDB11** and **VDB12**) were identified close to the R57 national road. Two additional burial grounds were identified during the second phase of the fieldwork, both these burial grounds were identified in the western portion of the Project Site (Area 4). One burial ground (**VDB13**) with approximately two graves was identified 40m south-west of the Project Site. Another burial ground (**VDB14**) with approximately 50 graves was identified in an open field. Due to the cultural and religious significance of burial grounds, the site is graded as Grade IIIA.

The possibility of the burial grounds being impacted by the proposed Vanderbijlpark Solar Energy Facility cannot be excluded, and the project can potentially have a **HIGH** impact without mitigation. Implementation of the recommended management and mitigation measures can reduce the impact rating to **LOW**.

8.3 Historical Structures

The recent historic structures (**VDB03, VDB04, VDB05, VDB06, VDB07, VDB10** and **VDB15**) are all younger than 60 years and vary in preservation. Some are abandoned and others are used as stored facilities or residential areas. The structures and remains of structures are not conservation

worthy and contain no cultural or scientific value and are consequently graded as **not conservation worthy (NCW)**.

The trigonometrical beacon (**VDB02**) is older than 60 years as it was identified during a desktop study of historical topographical maps from the 1950s. The beacon has historical value and is still in good condition. The site has a moderate heritage significance and is graded as Grade IIIB.

The impact on the recent historic structures identified during the fieldwork can potentially have a **LOW** significance before and after the implementation of the proposed mitigation measures.

8.4 Palaeontology

The proposed development is largely underlain by Quaternary deposits, while a portion is underlain by the Vryheid Formation (Ecca Group, Karoo Supergroup). A small portion in the west is underlain by diabase, while a portion in the south-west is underlain by the Daspoort Formation of the Pretoria Group (Transvaal Supergroup).

According to the PalaeoMap of the South African Heritage, Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Quaternary alluvial deposits are Low, while the Quaternary Superficial deposits have a Moderate Palaeontological Sensitivity and that of the Vryheid Formation is Very High. The Pretoria igneous intrusions have a Zero Palaeontological Sensitivity while that of the Daspoort Formation is High. Updated (Council of Geosciences, Pretoria) indicates that the study area is largely underlain by Quaternary alluvium, colluvium, alluvium and gravel.

It is thus recommended that a Phase 1 field-based assessment report be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the likely impacts.

8.5 Mitigation Measures

Mitigation measures are described in **Table 16** of this report.

8.6 Recommendations

The HIA concludes that heritage resources are present within the Project Site of the Project. The initial projected impact on heritage resources is rated as **MODERATE** to **HIGH** before mitigation measures.

Through the combination of the various environmental, cultural, and socio-economic sensitivities, the client can develop various layout options that will reduce the impact on the heritage resources. There is, however, a possibility that the combined sensitivity mapping can lead to some of the heritage resources not being accommodated in the layouts.

8.7 Conclusion

It is the combined considered opinion of the heritage specialists that the proposed project will have a direct impact on several identified heritage resources rated as being of **LOW** to **HIGH** heritage significance. Provided that the recommended mitigation measures are implemented, the impact would be acceptably **LOW** or could be mitigated to the degree that the project could be approved from a heritage perspective. The management and mitigation measures as described in **chapter/section 7** of this report have been developed to minimise the project's impact on heritage resources.

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9.4 Google Earth and QGIS

All the aerial depictions and overlays used in this report are from Google Earth and QGIS.

APPENDIX A

ENVIRONMENTAL IMPACT METHODOLOGY

SAVANNAH ENVIRONMENTAL: IMPACT ASSESSMENT METHODOLOGY

Scoping Report Requirements

The Scoping Report should be in line with the EIA Regulations of 2014, as amended on 07 April 2017 and Savannah Environmental's requirements. Where relevant, the report must be in line with the gazetted protocols.

***Example* of Scoping evaluation table summarising the impacts identified**

Impact [description of the impact]			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Potential loss of faunal species	Direct impacts: » Loss of habitat will potentially lead to a loss faunal species Indirect impacts: » Minimal edge effects leading to loss of habitat outside development site, thus loss of faunal species	Regional	None identified at this stage
Potential loss of Species of Special Concern	Direct impacts: » None Indirect impacts: » Loss of protected species in terrestrial habitat	National	None identified at this stage
Description of expected significance of impact The proposed development site has a long history of transformation and therefore the impacts on the terrestrial environment are likely to be limited as the species typically resident in and around urban and industrial areas are commonly generalists with a wide range of habitat types. Protected species such as *Crinum stuhlmannii* and *Zoothera guttata* have potential to occur on the proposed development site. However, no protected species were observed within the development areas during the previously conducted site visits. Impacts can be minimised through the implementation of appropriate mitigation measures.			
Gaps in knowledge & recommendations for further study » Mapping of all protected species and species of special concern within the development footprint. » Mapping of known and potential habitats used in breeding, foraging, roosting, aestivation and hibernation. » Describing the condition of all habitats and clearly indicating these on an Ecological sensitivity map. » Indication of the potential of protected species to occur on the proposed development site.			

Recommendations with regards to general field surveys

- Field surveys must include the proposed development site and adjacent surrounding areas with indigenous vegetation and habitats within a 500 m radius of the project footprint.
- In season (November to April) follow-up terrestrial site visits to determine the diversity of resident fauna species
- In season follow-up terrestrial site visits to determine the diversity of vegetation species.
- A follow up site visit is to be undertaken for small mammal trapping.
- Active search will be required for the protected species and species of concern that have a high probability of occurrence which will be impacted by the proposed facility.

EIA Report Requirements

The EIA Report should be in line with the EIA Regulations of 2014, as amended on 07 April 2017 and Savannah Environmental's requirements. Where relevant, the report must be in line with the gazetted protocols.

The EIA Report must consider the latest layout provided and should include:

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) that have been identified
- Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the EIA Report in terms of the following criteria:
  - the nature, which shall include a description of what causes the effect, what will be affected and how it will be affected;
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- a comparative evaluation of the identified feasible alternatives, and **nomination of a preferred alternative**
- Any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation
- This must also include any gaps in knowledge at this point of the study. Consideration of areas that would constitute "acceptable and defendable loss" should be included in this discussion.
- A reasoned opinion as to whether the proposed project should be authorised.
- Summary of the positive and negative impacts and risks of the proposed project and identified alternatives.
- Mitigation measures and management recommendations to be included in the Environmental Management Programme to be submitted with the FEIR

Assessment of Impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5;
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified way
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the *degree* to which the impact can be *mitigated*.

The **significance** is calculated by combining the criteria in the following formula:

S = (E+D+M) P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),

» > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Assessment of impacts must be summarised in the following table format. The rating values as per the above criteria must also be included. Complete a table and associated ratings for **each** impact identified during the assessment.

***Example* of Impact table summarising the significance of impacts (with and without mitigation)**

Nature: **[Outline and describe fully the impact anticipated as per the assessment undertaken]**			
Impact description: The impact will occur due to added pressure on the availability of housing located in the local community. This may contribute to increased levels of competition in the temporary housing market.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Short-term (1)	The construction period will last for less than one year	**Low Negative (18)**
Extent	Local (1)	Pressure will only be added on the local municipality to provide housing for outsourced construction workers	
Magnitude	Low (4)	The increase in demand for affordable accommodation should not be extensive as workers will primarily be sourced from the local communities.	
Probability	Probable (3)	The possibility of the impact on the provision of affordable accommodation is very low	
Mitigation/Enhancement Measures			
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible. • Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.			
Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	Pressure will only be added on the local municipality to provide housing for outsourced construction workers.	**Low Positive (8)**
Extent	Local (1)	The increase in demand for affordable accommodation should be mitigated if external construction crews are provided with onsite accommodation.	
Magnitude	Minor (2)	The possibility of the impact on the provision of affordable accommodation is very low.	

Probability	Improbable (2)	A reduced amount of pressure will be added on the local municipality to provide housing for outsourced construction workers.	
Cumulative impacts: "Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.			
Residual Risks: "Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014).			

Assessment of Cumulative Impacts

As per requirements of the EIA Regulations, specialists are required to assess the cumulative impacts. In this regard, please refer to the methodology below that will need to be used for the assessment of Cumulative Impacts.

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[2].

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

The specialist is required to conclude if the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

Example of a cumulative impact table:

Nature: Complete or whole-scale changes to the environment or sense of place (example)

Nature: **[Outline and describe fully the impact anticipated as per the assessment undertaken]**		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)

[2] Unless otherwise stated, all definitions are from the 2014 EIA Regulations, as amended, GNR 326

Duration	Medium-term (3)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (12)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible. Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.		

Environmental Management Plan Table format

Measures for inclusion in the draft Environmental Management Programme must be laid out as detailed below:

OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

Project component/s	List of project components affecting the objective
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving objective
Mitigation: Target/Objective	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting

APPENDIX B

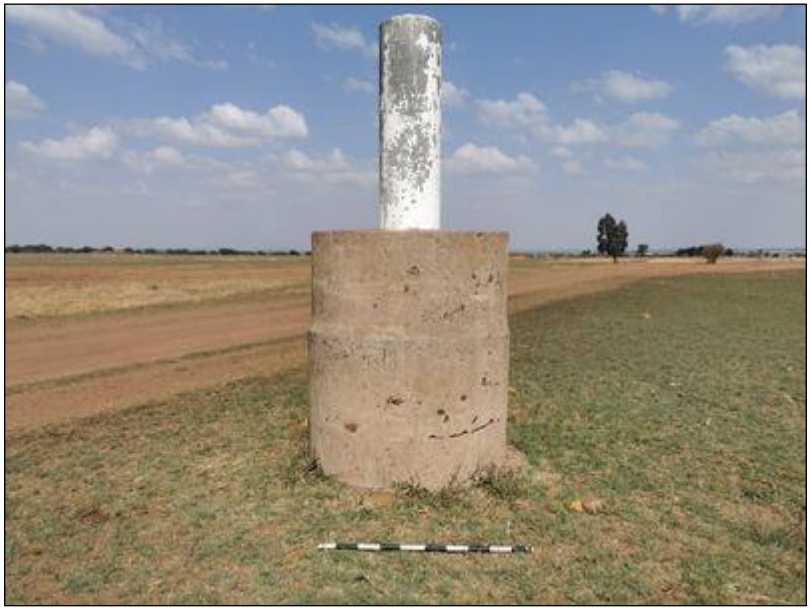
SITE DESCRIPTION FORMS

Site Co-ordinates		
Site Number	**X**	**Y**
VDB01	27.95145957	-26.33485786
VDB02	27.84574735	-26.62899452
VDB03	27.78860083	-26.65695241
VDB04	27.80400123	-26.63828918
VDB05	27.79228718	-26.62814266
VDB06	27.79585064	-26.6220017
VDB07	27.78694597	-26.64722804
VDB08	27.78572448	-26.64855982
VDB09	27.78685469	-26.65305529
VDB10	27.80091589	-26.63674818
VDB11	27.78315292	-26.65771563
VDB12	27.78376185	-26.6634978
VDB13	27.747329	-26.674544
VDB14	27.75045	-26.66397
VDB15	27.75438	-26.65905

SITE SURVEY REPORT

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB01	-26.33486	27.95146	**General Landscape Characteristics** Flat-lying open area with grassy vegetation. The area also has evidence of dumping and old excavations (diggings). The area had been previously disturbed by industrial activities. **Site Conditions** Overgrown with vegetation, which means limited visibility. **Time Period** Recent. **Site Type** Burial Grounds and Graves. **Site Extent** 5m x 5m. **Notes** A single possible grave is located at the site which has a stone-packed dressing. No other associated cultural material is located at the possible grave.	HIGH	IIIA

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB02	-26.62899	27.84575	**General Landscape Characteristics** Flat-lying open area with grassy vegetation. **Site Conditions** Clear and open field. **Time Period** Recent. **Site Type** Trigonometrical Beacon (no 556). **Site Extent** 5m x 5m **Notes** A Trigonometrical Beacon was identified from the second edition 1954 Topographical Map (No 566). The trig beacon has a round grey concrete base, with a smaller round spherical pillar which is located on top of the base structure and is covered in white paint.	MODERATE	IIIB



...

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB03	-26.65695	27.7886	**General Landscape Characteristics** Flat-lying open area with grassy vegetation and some trees in the area. **Site Conditions** Clear open field. A recent veld fire has cleared the area. **Time Period** Recent. **Site Type** Round concrete reservoir. **Site Extent** 10m x 10m. **Notes** Round grey concrete reservoir, which is currently empty and in a dilapidated state.	No research potential or other cultural significance	NCW

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating

...

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VBD04	-26.63829	27.804	**General Landscape Characteristics** Flat-lying open area with grassy vegetation and some trees in the area. **Site Conditions** The structure is disturbed in the sense that it is abandoned and destroyed in certain areas. **Time Period** Recent. **Site Type** Recent Structure (Farmstead). **Site Extent** 20m x 20m. **Notes** The structure is identified as an old farmstead and consists of the main structure, a separate smaller structure (which is located close to but not attached to the main structure), and a small square structure with a water tank (Jojo) on top of it. The main building is made up of bricks, concrete and a corrugated iron roof, and the windows are broken. The smaller separate structure is also made up of bricks which have been plastered with concrete, and the structure has a corrugated-iron roof. The structure doesn't have any windows, but only three different doors. The small square water	No research potential or other cultural significance	NCW

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
			tank structure appears to be empty and is made up of bricks and the green plastic Jojo tank on top of the structure.		

...

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB05	-26.62814	27.79229	**General Landscape Characteristics** Flat-lying open area with grassy vegetation and some trees in the area. **Site Conditions** The structure is disturbed in the sense that it is abandoned and destroyed in certain areas. The area around the structure is open and clear. **Time Period** Recent. **Site Type** Recent Structure (Residential). **Site Extent** 15m x 15m. **Notes** The remains of a broken-down structure are located at this site. Only two walls remain standing from the structure. The structure consists of bricks and concrete and appears that the inside of the building was once painted in a light blue colour. The area is fenced and there is a dirt road leading up to the house.	No research potential or other cultural significance	NCW

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
			 ...		

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB06	-26.62200	27.79585	**General Landscape Characteristics** Flat-lying open area with grassy vegetation and some trees in the area. **Site Conditions** The structure is disturbed in the sense that it is abandoned and destroyed in certain areas. **Time Period** Recent. **Site Type** Recent Structure (Residential). **Site Extent** 15m x 15m. **Notes** Remains of a broken-down structure. The structure consists of bricks and concrete. The base of the structure which is made up of bricks is still visible. What remains of the structure appears to be two separate rooms within the building. A small air vent is also visible at the top centre of the wall. The area around the structure is covered in old building ruddle.	No research potential or other cultural significance	NCW

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
			  ...		

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB07	-26.64723	27.78695	**General Landscape Characteristics** Flat-lying open area with grassy vegetation. **Site Conditions**	No research potential or other cultural significance	NCW

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
			Clear open area. **Time Period** Recent. **Site Type** Recent Structure (Storage facility for farming activities). **Site Extent** 50m x 50m. **Notes** A couple of large sheds or possible storage facilities. The sheds are made up of corrugated iron materials and the structures are also surrounded by electric fencing. This structure is surrounded by large areas of agricultural fields and is currently in use. Vehicles and equipment associated with agricultural activities are located at these sheds. A dirt road runs along and into the fenced area with the corrugated iron structures.		

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating

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Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB08	-26.64856	27.78572	**General Landscape Characteristics** Flat-lying area with grassy vegetation. **Site Conditions** The site is slightly overgrown with vegetation with limited visibility. The graves are cleared of vegetation, but the area surrounding the graves is overgrown. **Time Period** Recent. **Site Type** Burial Grounds and Graves. **Site Extent** 15m x 15m. **Notes** A total of eight (8) graves were identified at this burial ground, close to the recent structure (VDB07), located within an old agricultural field. Some graves have marble headstones with concrete dressing whereas others have stone-packed dressing. Some of the graves have cultural material on the surface which includes plastic and/or glass bottles, ceramics cups and plates, and plastic snuff containers.	HIGH	IIIA


MOTAUNG
THABO
SAKE

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
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Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB09	-26.65306	27.78685	**General Landscape Characteristics** Flat-lying area with grassy vegetation. **Site Conditions** The area is very overgrown with vegetation which causes limited visibility. The burial ground itself is covered in dense vegetation, with the surrounding agricultural field being previously cleared. **Time Period** Recent. **Site Type** Burial Grounds and Graves. **Site Extent** 50m x 50m. **Notes** This burial ground is located approximately 50m from the first burial ground (VDB08). The burial ground contains approximately 60 graves and is located within an old agricultural field. Due to the dense vegetation, it was problematic to identify all the graves in the area. Most of the graves have stone-packed dressing, with only a few graves with concrete or marble headstones. Some of the graves contain evidence of associated cultural material, which includes plastic bottles, ceramic cups, plates and pots.	HIGH	IIIA

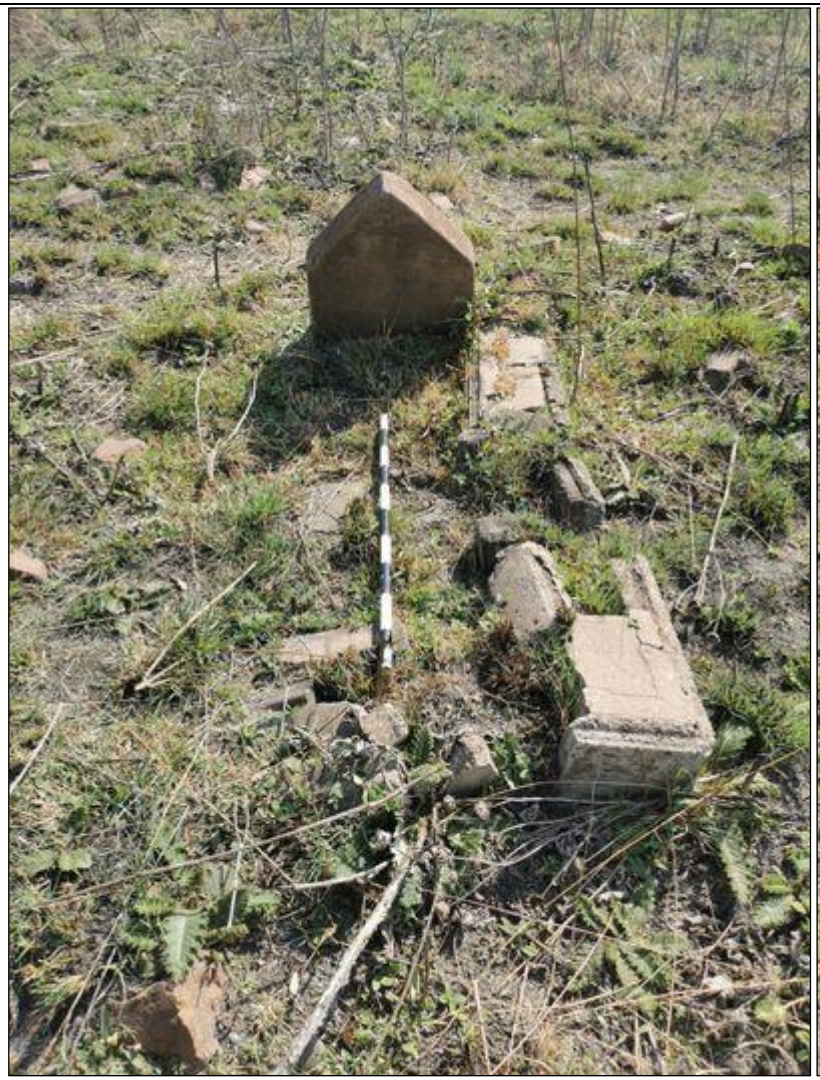

TUNDZA

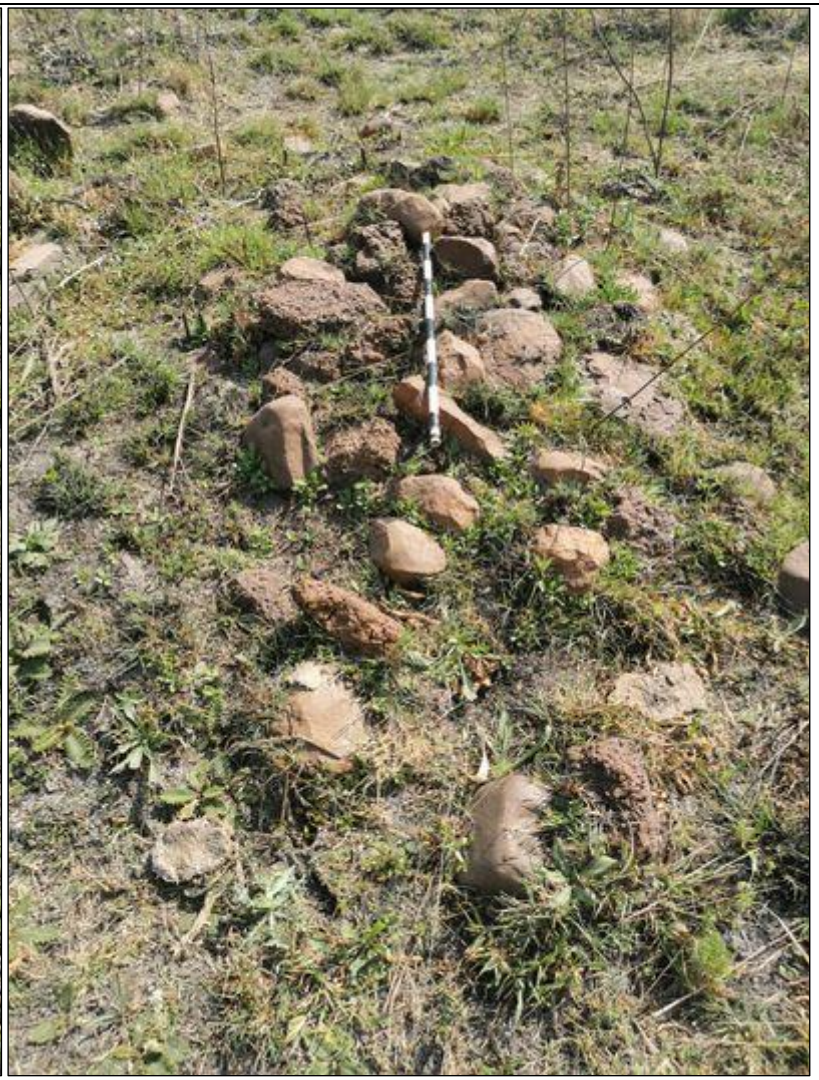
Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating

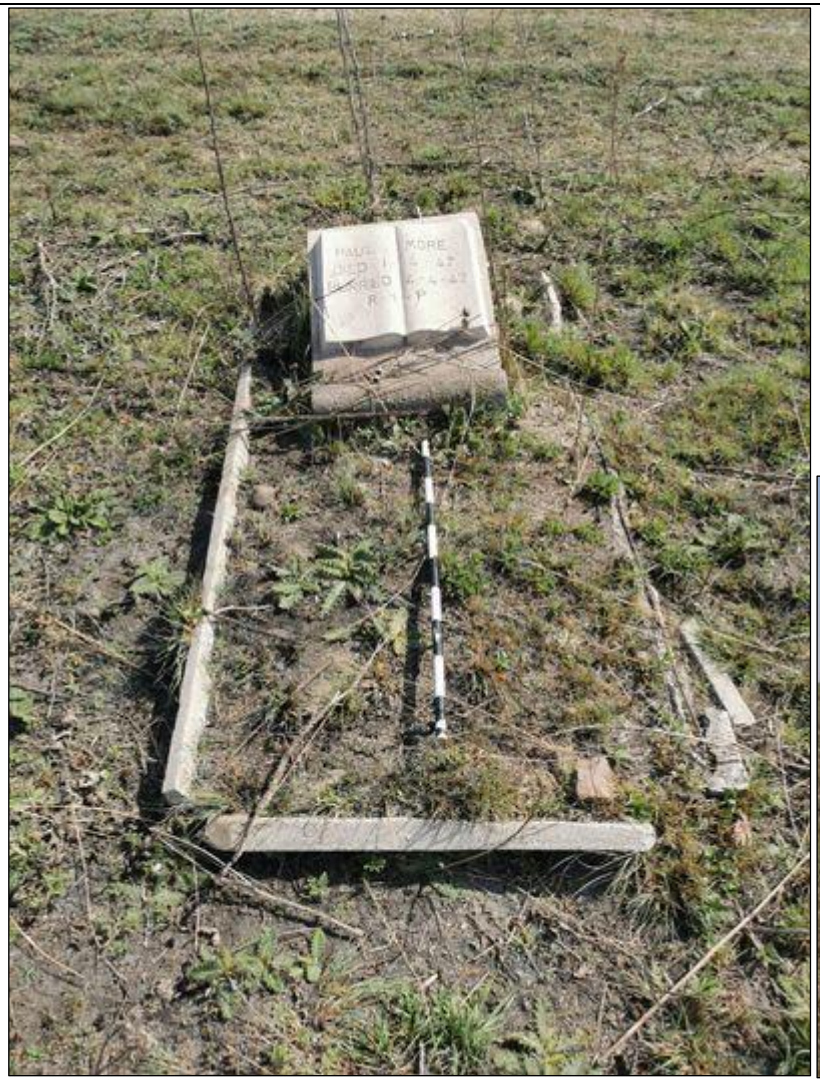
Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VFB10	-26.63675	27.80092	**General Landscape Characteristics** Flat-lying areas, with grassy vegetation and some trees located in the area. **Site Conditions** The site is slightly overgrown with vegetation (long grass), and some trees are located in the area surrounding the structure. **Time Period** Recent. **Site Type** Recent Structure (Residential). **Site Extent** 20m x 20m. **Notes** The structure is a large house made up of bricks, concrete and a tiled roof. The windows and doors are still intact. The structure is surrounded by a fence and has a gate and a dirt road that leads up to the house. The structure also has a small 'stoep' and is surrounded by some trees which include palm trees.	No research potential or other cultural significance	NCW

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
			 ...		

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB11	-26.65772	27.78315	**General Landscape Characteristics** Flat-lying area, with grassy vegetation. The site is located next to the R554 national road. **Site Conditions** Clear and open field. **Time Period** Recent. **Site Type** Burial Grounds and Graves. **Site Extent** 20m x 20m. **Notes** This burial ground is located next to the R57 nation road and contains approximately 15 graves. Some of the graves have stone-packed dressing and others concrete dressing, the headstones also consist of concrete. Some of the headstones have been damaged. No associated cultural material was identified on the surface.	HIGH	IIIA







Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
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Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB12	-26.6635	27.78376	**General Landscape Characteristics** Flat-lying area, with grassy vegetation. The site is located next to the R554 national road. **Site Conditions** Clear and open field. **Time Period** Recent. **Site Type** Burial Ground and Graves. **Site Extent** 10m x 10m. **Notes** This burial ground consists of approximately 3 graves. Two of the graves have stone-packed dressing. One grave has a rounded concrete headstone with an illegible inscription. The graves are currently located underneath a powerline and approximately 20m from the R57 national road.	HIGH	IIIA

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
					

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB13	-26.674544	27.747329	**General Landscape Characteristics** Small fenced area with approximately two graves hidden by dense grass cover. The graves are associated with farmstead close by. **Site Conditions** Area is overgrown.	HIGH	IIIA

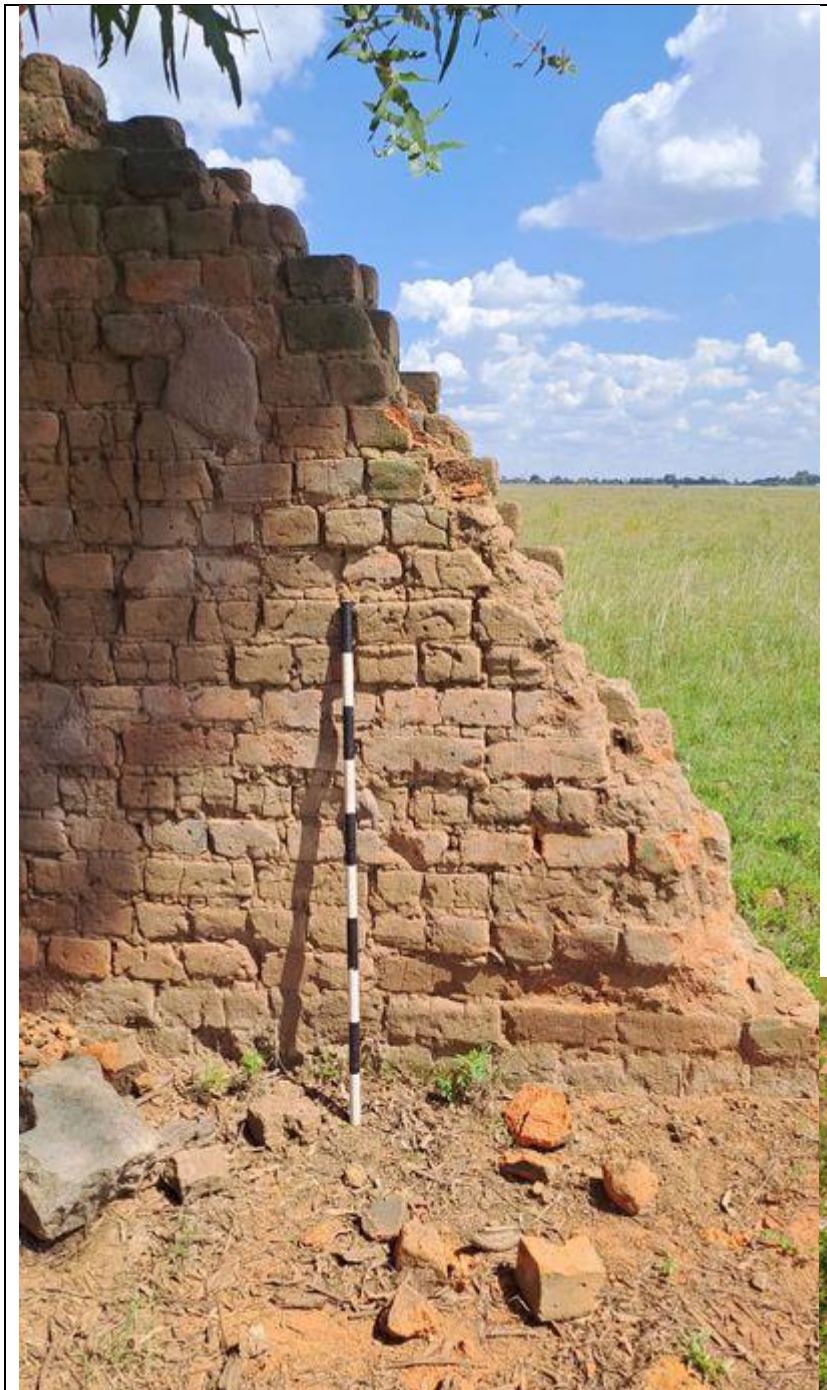
Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
			Time Period Recent. **Site Type** Burial Ground and Graves. **Site Extent** 5m x 5m. **Notes** This burial ground consists of approximately 2 graves. The graves are fenced and located next to an old farmstead which is still occupied by people. The graves have marble and concrete dressing, and is overgrown by thick vegetation. These two graves are located approximately 40m outside the AMSA – 5 area.		

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB14	-26.66397	27.75045	**General Landscape Characteristics** Flat lying area, Grassy vegetation **Site Conditions** Overgrown/ limited visibility **Time Period** Historical Period, Recent **Site Tipe** Graves **Site Extent** 40x40m **Notes** Several graves located in this informal burial ground. Dressings consist of either stone packed or concrete dressings. Some of the graves have concrete headstones as well. There are approximately 40 graves. The area seems abandoned as there is no evidence of family coming to visit their graves.		Grade 3 - A (IIIA)

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
   ...					

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
VDB15	-26.65905	27.75438	**General Landscape Characteristics** Flat lying area, Grassy vegetation **Site Conditions** Overgrown/ limited visibility, Disturbed, Demolished/Destroyed **Time Period** Recent **Site Tipe** Recent Structure **Site Extent** 15m x 15m **Notes** Remains of a red brick and concrete structure. The walls were once covered in white concrete plaster. The remains of a window is still visible.		NCW



Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
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APPENDIX C

PGS TEAM CVS

PROFESSIONAL CURRICULUM FOR WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

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

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

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

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

Key Qualifications

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

BA - Archaeology, Geography and Anthropology - 1996

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

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

CRM Accreditation (ASAPA) -

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

Key Work Experience

2003- current - Director – PGS Heritage (Pty) Ltd

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

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

2000-2004 – CEO – Matakoma Consultants

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

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

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

PROFESSIONAL CURRICULUM FOR MICHELLE SACHSE

Archaeologist for PGS Heritage

Summary of Experience

Involvement in various grave relocation projects in the various provinces of South Africa. Expertise in Heritage Impact Assessment Surveys, Historical and Archival Research, Archaeology, and Fieldwork including *inter alia* -

Involvement with various Heritage Impact Assessments,

- Heritage Impact Assessments within Gauteng, Limpopo, Mpumalanga, Free State, North West and the Northern Cape and Western Cape Provinces.
- Archaeological Walkdowns for various projects.
- Desktop, archival and heritage screening for projects.
- Instrument Survey and recording for various projects.

Heritage Impact Assessments:

- Proposed New Pit for Msobo Coal (Spitzkop Colliery), in Ermelo, within the Mpumalanga Province. **Position:** Heritage Specialist.
- The Proposed Harmony FSS6 Reclamation Pipeline, Welkom, Free State Province. **Position:** Heritage Specialist.
- Heritage Impact Assessment Report, for the Proposed Kalgold Expansion Project between Mafikeng and Vryburg, the North West Province. **Position:** Heritage Specialist.
- Heritage Impact Assessment Report, for the Proposed Chartwell Data Centre Project in Chartwell, Johannesburg, Gauteng Province. **Position:** Heritage Specialist.
- Proposed Development on Portions of the Farm Rondebult 303 JS, Near Kwa-Guqa, Emalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province. **Position:** Heritage Specialist.
- The Buffelspoort Solar Photovoltaic (PV) Energy Facility, on Portions 75 and 134 of the Farm Buffelspoort 343 JQ, between Buffelspoort and Mooinooi, in the North West Province. **Position:** Heritage Specialist.
- Proposed Development on Portion 7 of the Farm Langkuil 363 IR, in Meyerton, within the Midvaal Local Municipality, and the Sedibeng District Municipality, in the Gauteng Province**. Position:** Heritage Specialist.
- Heritage Impact Assessment report for the Eskom Gamohaan – Seven Miles 22kV Powerline. On the remaining extent of the Farm Kuruman Reservaat 690, outside and within the informal settlement of Mamoratwe, close to the town of Kuruman, in the Northern Cape Province. **Position:** Heritage Specialist.

Grave Relocation Projects:

- Report on the Relocation of Graves: Relocation of 22 Graves at Nkomati Anthracite Mine on the Farm Fig Tree 503 JU, near Madadeni Mpumalanga Province.
- Report on the Relocation of Graves: Relocation of 27 Graves Located on the Farm Welstand 55 IS, near Kriel, Mpumalanga Province.
- Report on the Relocation of Graves: Relocation of 6 Graves Located on the Farm Klipfontein 241 IS, near Breyten, Mpumalanga province.
- Report on the Relocation of Graves. Relocation of 68 Graves Located at Erf 4460, 4461 and 4463, Kudube Unit 4, in Hammanskraal, Gauteng Province.
- Report on the Relocation of Graves: Relocation of Ten (10) Graves for the Vreugdenburg Family on Portion 246 of the Farm Roodekopjes 417 JQ, near Brits, North-west Province.
- Report on the Relocation of Graves: Two (2) Graves Located at Msobo Coal Mine (Albion Southwest Pit) on Portion 6 of the Farm Witbank 82 IT, near Breyten, Mpumalanga Province.
- Report on the Relocation of Graves: One (1) Grave at Msobo (Spitzkop) on Portion 3 of the Farm Voorslag 274 IS, between Breyten and Ermelo, in the Mpumalanga Province.

Key Qualifications

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

Professional Qualifications

Professional Archaeologist - Association of Southern African Professional Archaeologists - Professional Member – No 526

Key Work Experience

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