



PGS HERITAGE

14MW MACHADODORP PV 1 SOLAR ENERGY FACILITY

On Portion 8 of the Farm De Kroon 363 of the Emakazheni Local Municipality in Mpumalanga Province

Heritage Impact Assessment

Template Number	Document Number	Revision	Date
PGS PJ REP 007 01	716HIA-001	2.0	09/07/2023



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REVISION HISTORY

Version	Issue Date	Description of Changes
001	26/06/2023	First draft
002	11/07/2023	Second draft

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Declaration of Independence

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

Disclosure of Vested Interest

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

HERITAGE CONSULTANT:

PGS Heritage (Pty) Ltd

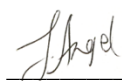
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ACKNOWLEDGEMENT OF RECEIPT

Report Title			
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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 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 5
(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 and B
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 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	Section 4
(k) Any mitigation measures for inclusion in the EMPr	Section 6
(l) Any conditions for inclusion in the environmental authorization	Section 6
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorization	Section 6
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 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	
(o) A description of any consultation process that was undertaken during the course of carrying out the study	Informal consultation in fieldwork.
(p) A summary and copies if any comments that were received during any consultation process	Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs

EXECUTIVE SUMMARY

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Savannah Environmental (Pty) Ltd appointed PGS Heritage (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Assessment (BA) amendment application to extend the validity of the issued Environmental Assessment beyond ten years, for the proposed construction of 14MW Machadodorp PV 1 Solar Energy Facility (SEF) on Portion 8 of the Farm De Kroon 363 of the Emakazheni Local Municipality in Mpumalanga Province. This HIA was undertaken due to the time elapsed between the original study in 2012 and the amendment in order to confirm that the environment has not changed and the impacts predicted in the previous study remain unchanged.

The HIA identified NO heritage resources within the study area, NO further mitigation work is required before the project can continue.

The findings of the original 2012 HIA and Palaeontological study is confirmed. It is the combined opinion of the heritage specialists that the proposed project will have no impact on heritage resources.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

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

Cultural significance

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

Development

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

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

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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 not limited to) as stated under Section 3 of the NHRA,

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

Holocene

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

Late Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

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

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Palaeontology

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

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA-G	Gauteng Provincial Heritage Resources Authority
PHS	Provincial Heritage Site
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SEF	Solar Energy Facility

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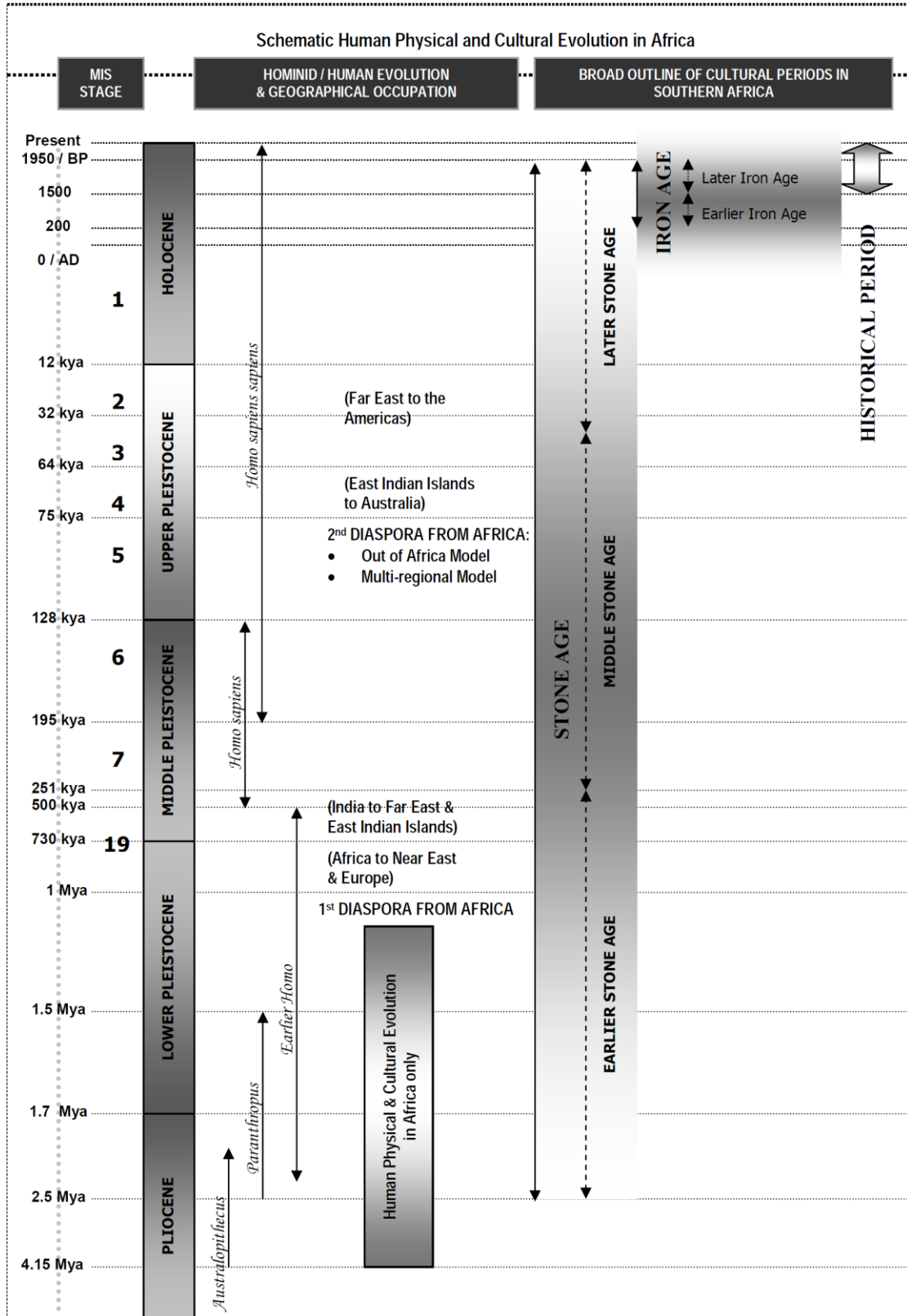


Figure 1 – Human and Cultural Timeline in Africa

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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 Basic Environmental Assessment (BA) amendment application to extend the validity of the issued Environmental Assessment beyond ten years, for the proposed construction of 14MW Machadodorp PV 1 Solar Energy Facility (SEF) on Portion 8 of the Farm De Kroon 363 of the Emakazheni Local Municipality in Mpumalanga Province.

This HIA was undertaken due to the time elapsed between the original study in 2012 and the amendment, in order to confirm that the environment has not changed and the impacts predicted in the previous study remain unchanged.

1.1 Scope of the Study

The aim of the study is to identify heritage sites and finds that may occur in the proposed project area. The HIA aims to inform the amendment application to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA Report was compiled by 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.

Jessica Angel, the author of this report, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA). She has 10 years of experience in the heritage assessment field and holds a Master's degree (MSc) in Archaeology from the University of the Witwatersrand.

Shannon, Hardwick, second author of this report, holds a Masters degree (MSc) in Archaeology from the University of the Witwatersrand and has six years' experience as a heritage consultant. She is a registered member of the Association of Southern African Archaeologists (ASAPA), the

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International Association for Impact Assessment South Africa (IAIASa) and the International Council on Monuments and Sites (ICOMOS).

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).

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 study area was accessible for the fieldwork survey.

Fieldwork was also focussed on area that was not previously ploughed or disturbed by farming activity, thus focussing on areas with the highest potential to yield heritage resources.

Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the construction activities, a heritage specialist must be contacted immediately. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 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

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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 noted.

Table 1: Reporting requirements for GN648

GN 648	Relevant section in 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 utilized as the basis for the identification, evaluation, and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

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2 TECHNICAL DETAILS OF THE PROJECT

2.1 Locality

The proposed PV facility is located 4 km to the south west of eNtokozweni (Machadodorp) on the N4 national highway, Emakhazeni Local Municipality, Nkangala District Municipality, Mpumalanga Province (**Figure 2**).

2.1.1 Site Description

The application area is situated on Portion 8 of the Farm De Kroon 363 with a footprint area of approximately 23.5 ha (**Figure 2**).

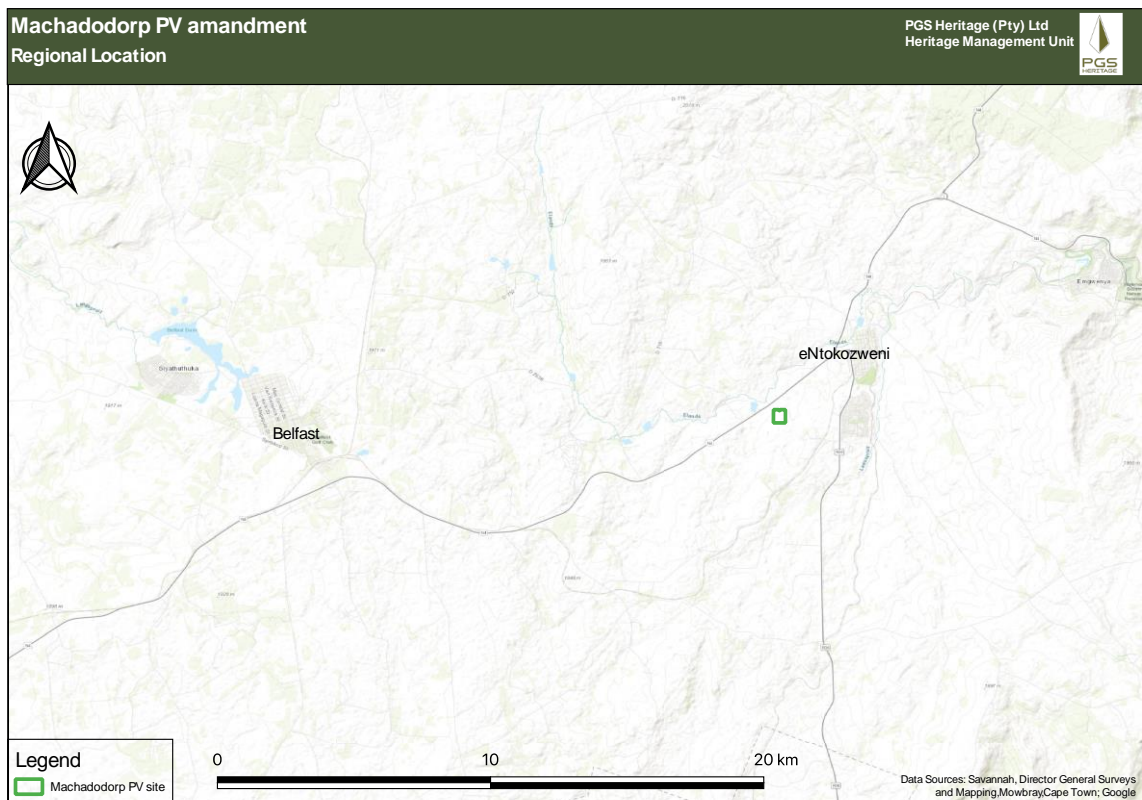


Figure 2 - Regional Locality of study area (green polygon)

2.2 Technical Project Description

2.2.1 Project description

Machadodorp1 PV Project (Pty) Ltd proposes a commercial photovoltaic solar energy facility as well as associated infrastructure (Machadodorp PV 1 Solar Energy Facility).

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The Solar Power Plant is proposed to accommodate the following infrastructure:

- Photovoltaic (PV) Panel with and installed capacity of up to 10MW.
- A on-site substation and overhead power line/s connecting to existing the Machadodorp Substation;
- Mounting structures (either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels);
- Cabling between the project components, to be lain underground where practical;
- Internal access roads; fencing and
- Workshop area for maintenance, storage and offices.

The overall aim of the design and layout of the facility is to maximise electricity production through exposure to the solar radiation, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. The use of solar energy for power generation can be described as a non-consumptive use of natural resources which emits zero greenhouse gas emissions. The generation of renewable energy will contribute to South Africa's electricity generating market.

The Solar Power Plant will comprise of the following components:

The Photovoltaic Cell

A photovoltaic (PV) cell can consist of a thin film technology or polycrystalline silicone cell which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

The Inverter

The photovoltaic effect produces electricity in direct current. Therefore, an inverter must be used to change it to alternating current.

The Support Structure

The PV panels will be attached to a steel support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics.

The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

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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 Machadodorp PV amendment. 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 the 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 19 and 21 April 2022), 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.

The significance of heritage sites is based on four main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
 - Low - <10/50m²
 - Medium - 10-50/50m²
 - High - >50/50m²
- Uniqueness; and
- Potential to answer present research questions.

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

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

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D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

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 update classification and rating system as developed by Heritage Western Cape (2016) is implemented in this report

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

Table 2: 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 as 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 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. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	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 significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the	Low Significance

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
		recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	
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: 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 as a National Heritage Site managed by SAHRA.	Highest 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 local level.	High Significance
IIIB	Such a resource might have similar significances 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	Medium Significance

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
		IIIA buildings and sites at local level.	
IIIC	Such a resource is of contributing significance to the environs 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, as a consequence, 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 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 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.	No research potential or other cultural significance

3.2 Methodology used in determining the significance of environmental impacts.

The methodology used to determine the impact significance is explained in **Appendix B**.

4 CURRENT STATUS QUO

4.1 Site Description

The proposed Machadodorp PV amendment footprint area is characterised by disturbed grass lands with refuse landfills and rocky out crops.

In terms of vegetation, the study area is characterised by the following vegetation type.

The **Steenkampsberg Montane Grassland** (Gm 30). The landscape is mountainous with plateau grasslands, mountain slopes and shallow valleys. Grasslands are short with high forb diversity. The highest point in Mpumalanga (2330 m) occurs just north of the Steenkampsberg Pass (<http://bgisviewer.sanbi.org/> Mucina & Rutherford, 2006).

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In terms of geology and soils, the area is characterised by shallow to deep, well drained soils which are mostly derived from quartzite which results in sandy, white dystrophic soils with high humus content. (Mucina & Rutherford, 2006).



Figure 3 – View of the general vegetation



Figure 4 – Existing powerlines



Figure 5 – Refuse landfill



Figure 6 – View of Milly's on the N4, north-east of the study area

4.2 Overview of the study area and surrounding landscape

DATE	DESCRIPTION
2.5 million to 250 000 years ago	<p>The Earlier Stone Age (EIA) is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan which is associated with crude flakes and hammer stones and dates to approximately 2 million years ago.</p> <p>The second technological phase in the Earlier Stone Age of Southern Africa is known as the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates to approximately 1.5 million years ago.</p>

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DATE	DESCRIPTION
	<p>In the Mpumalanga Province, ESA artefacts including choppers, hand axes and cleavers have also been found at Maleoskop on the farm Rietkloof, located 60 km north of Middelburg (Esterhuysen & Smith, 2007).</p> <p><i>No ESA sites are known from the immediate vicinity of the footprint area.</i></p>
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA) is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique (Korsman, & Meyer, 1999).</p> <p>In the Mpumalanga Province, MSA tools have been found at Bushman Rock Shelter, a site continuously occupied during this period, on the farm Klipfonteinhoek in the Ohrigstad District, located approximately 100 km north of eNtokozweni (Esterhuysen & Smith, 2007).</p> <p>Near Malelane, ochre was mined at Dumaneni during the MSA (Bornman, 1995; Van Wyk Rowe, 2015).</p> <p><i>No MSA sites are known from the immediate vicinity of the footprint area.</i></p>
40 000 years ago, to the historic past	<p>The Later Stone Age (LSA) is the third phase identified in South Africa's Stone Age history. This phase in human history is associated with an abundance of very small stone artefacts or microliths.</p> <p>Several LSA rock engraving site have been found in the Mpumalanga Province near Lydenburg, Nelspruit, White River, Ermelo and the southern part of the Kruger National Park (Smith & Zubieta, 2007; Pistorius, 2014). Several LSA artefacts were also found in the upper layers at Bushman Rock Shelter (Esterhuysen & Smith, 2007). Near Badplaas, also known as eManzana, several LSA sites were found in close proximity of the Nhlazatshe River on the farm Honingklip (Esterhuysen & Smith, 2007).</p> <p>Apart from stone tools several rock art panels, beads, LSA stone-walling and Iron Age pottery of the Eiland facies were also found (Korsman & Plug, 1994; Esterhuysen & Smith, 2007). Several LSA sites have also been found in the Kruger National Park (Bergh, 1999).</p> <p><i>No LSA sites are known from the immediate vicinity of the footprint area.</i></p>
AD 200 – AD 900	<p>The earliest phase in the Iron Age history of Southern African is known as the Early Iron Age (EIA). The first Bantu-speaking farmers moved into the Mpumalanga region around 500 AD (Esterhuysen & Smith, 2007).</p> <p>Several EIA sites have been found in the Mpumalanga Province. These sites seem to be located near water sources which were most likely played an important role in Iron Age agricultural activities (Esterhuysen & Smith, 2007). Welgelegen Shelter located near Ermelo, which is approximately 95 km southwest of eNtokozweni, LSA tools and Iron Age pottery were found which is interpreted as evidence of the co-existence of farming and hunter-gatherer groups on one site (Esterhuysen & Smith, 2007).</p> <p>The earliest occupation to occur in the Lowveld (the section between the Drakensberg, Mozambique and the southern part of the Kruger National Park), was at Silver Leaves, around AD 280 - 450, a site located close to Tzaneen (Van Wyk Rowe, 2009).</p> <p>The Mzonjani pottery, followed Silver leaves facies, and dates to AD 450- 750 and is found within the Limpopo, KwaZulu-Natal, Mpumalanga and Gauteng Provinces (Maggs, 1980; Huffman, 2007).</p> <p>Two periods of occupation, the first around 600AD, and second around 900-1100 AD have been found at the Lydenburg head site (Esterhuysen & Smith, 2007).</p> <p>The Lydenburg head site is located 70km north-east of eNtokozweni. The ceramic heads found at the site date to the second occupation of the site.</p>

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DATE	DESCRIPTION
	<p>During EIA Copper was mined at two major centres to the north of Mpumalanga (Phalaborwa and Messina) from AD 750 (Esterhuysen & Smith, 2007).</p> <p><i>No EIA sites are known from the immediate vicinity of the footprint area.</i></p>
AD 900 – AD1300	<p>The second phase in the Iron Age history of Southern Africa is known as the Middle Iron Age (MIA). Welgelegen Shelter, located on the banks of the Vaal River near Ermelo was occupied at around AD 1200 by both hunter-gatherers and Iron age farmer communities (Esterhuysen & Smith, 2007). Iron tools, pottery and LSA tools have been found in the shelter suggesting the two groups occupied the shelter at the same time (Esterhuysen & Smith, 2007).</p> <p><i>No MIA sites are known from the immediate vicinity of the footprint area.</i></p>
AD 1300 – AD 1850	<p>The third and final phase in the Iron Age history of Southern Africa is known as the Late Iron Age (LIA) also referred to as Early Farming Communities or agropastoral communities.</p> <p>The LIA is distinguished from the EIA in Mpumalanga by the change in ceramic styles as well as through the numerous extensive stonewalled sites that are found throughout the region (Marker & Evers, 1976). Moorpark type walling have also been found in the Limpopo and Mpumalanga Province and is associated with Nguni speaking groups who migrated from the KwaZulu-Natal Province (Huffman, 2004). Lombard (1980) states that corbelled stone huts (which are also associated with the Late Iron Age) are found on the farms Tafelkop 270 and Middelpaat 271. According to Huffman (2007) corbelled stone huts appear to be associated with the so-called Type V Iron Age sites. These Type V settlements date from the period 1700 to 1850. Lombard (1980) also mentions a LIA group he refers to as the Nhlapo people and indicates that when the first white people came to stay in the Ermelo district, they already found the Nhlapo people in the vicinity of Maviristad. Myburgh (1956) refers to the followers of George Nhlapo who resided on the farm Witbank in the Ermelo District.</p> <p>Smaller farming communities including the Pai and Pulana settled around the Baberton and Nelspruit regions (Celliers, 2012a). During the Difiqane or Mfecane, around the early 1820's - 1830's many groups who settled in the Mpumalanga region were displaced because of Mzilkazi' Ndebele who moved through the area (Celliers ,2012a).</p> <p>The Voortrekkers under leadership of Andries Hendrik Potgieter moved through the Mpumalanga Province in the 1840's to settle at Ohrigstad, which was first established in 1845 (Celliers, 2012). It was here that the Voortrekkers and the Pedi Chief entered negotiations that would result in them acquiring farming land for which in turn they would provide protection from the Swazi's (Giliomee, 2003; Celliers, 2012).</p> <p>In the first half of the nineteenth century the Mpumalanga region was almost inhospitable as it was infested with Tsetse flies (Shillington, 1995; Bergh, 1999). However only after the outbreak of Rinderpest in 1897 in the area did farmers settle into the area again (Du Preez, 2012).</p> <p><i>No LIA sites are known from the immediate vicinity of the footprint area.</i></p>
1894	<p>Machadodorp was established on the farm "Geluk" in 1894 and was named after Joachim Machado, the Portuguese engineer who first surveyed the railway route between Pretoria and Delagoa Bay.</p>
1894-1904	<p>Jooste's examination of the history of Machadodorp (2008), notes that there is a very close link between the surveying, planning, building and development of the railway line from Pretoria to Delagoa Bay and the history of the establishment of Machadodorp. The process by which Machadodorp was proclaimed a town, which started before the outbreak of the Second South African War, was disrupted by the war and was only completed after the war. On 30 December 1904 Machadodorp was proclaimed a town (ibid). The town still contains numerous turn-of-the-century buildings (http://www.emakhazenilm.co.za/html/machadodorp.html).</p>

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DATE	DESCRIPTION
	<p>Cecelia Jooste provided a brief summary of the association of Machadodorp with the events of the South African War, specifically the Battle of Bergendal, in the Military History Journal Vol 12 No 4 December 2002:</p> <p>As early as 7 May 1900, the ZAR Government decided that Pretoria would not be defended. On the eve of 29 May 1900, President Kruger and his entourage left for Machadodorp, a small town situated on the ridge of the eastern Transvaal Highveld, along the Delagoa Bay Railway. This town became the seat of the ZAR Government until the defeat of the Boers at Bergendal. ... After defeating Boer forces at the battle of Bergendal, on 28 August, Buller's troops marched into Machadodorp, and on 1 September Roberts issued the proclamation declaring the entire Transvaal British territory. ... Although the ZARPs were defeated and the British won the battle, Botha's main force remained intact. The commandos dispersed to Lydenburg and Barberton, and a phase of guerilla warfare began. This second phase of the war lasted even longer than the first. Peace would only be declared at the end of May 1902. (Jooste, 2002)</p>
1948-present	<p>After 1948 the National Party government set about implementing apartheid with a zeal that created intensifying cycles of repression and resistance. For 40 years Mpumalanga was a key site of political struggles that are not widely known beyond its boundaries (Delius & Hay, 2009).</p> <p>Currently, Machadodorp's residents either work for the industries feeding a chrome smelter, or the logging industries based on the pine plantations surrounding the town. A large contingent of contract workers employed at the Nkomati mine about an hour's drive out of town also reside in Machadodorp, contributing a large part of the town's economy. In early 2010 the town had its name officially changed from Machadodorp to eNtokozweni (http://en.wikipedia.org/wiki/Machadodorp)</p>

4.2.1 Archival and historical maps

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

Historical topographic maps (1:50 000) for the year 1969 were available for utilisation in the background study. The first Edition map of Belfast's air photography was taken in 1964 and was surveyed in 1969, drawn in 1970. This map was assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA. **No heritage sites or features are depicted on the map.**

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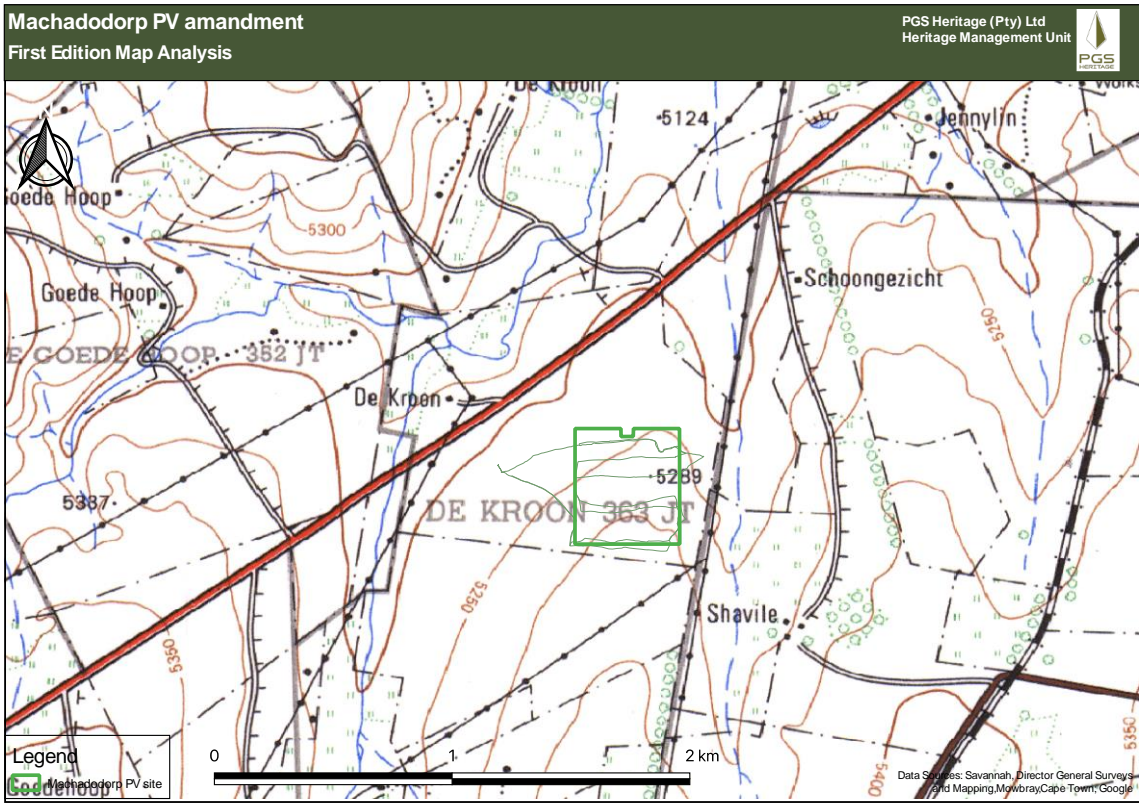


Figure 7 – First Edition 2530CA1969 Belfast Map with study area (green)

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4.2.2 *Previous heritage impact assessment reports from the study area 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 study area. In each case, the results of each study are shown in bold. These previous studies are listed below in ascending chronological order:

- Celliers, J.P, 2013. Phase 1 Archaeological Survey on the Remainder of Portion 23 of the farm Schoongezicht 364 JT, Emthonjeni Township, Emakhazeni Municipality, Machadodorp. For Enpact Environmental Consultants.

No sites of archaeological or heritage significance were documented.

- Celliers, J.P, 2016. Phase 1 Archaeological Impact Assessment on a Portion of the Remaining Extent of Portion 8 of the farm De Kroon 363-JT (to be known as Portion 20 of the farm De Kroon 363-JT) in respect of the proposed Milly's South Development/ Township near Machadodorp, Mpumalanga Province. For Enpact Environmental Consultants.

No sites of archaeological or heritage significance were documented.

- Küsel, U, 2011. Report on a visit to the Proposed Gumeni Bosloop 132 kV Power Line near Machadodorp, Mpumalanga Province

The area of the proposed new Gumeni/Bosloop power line will run through an area well known for the many archaeological sites that occur in the area. Several stone walled sites were discovered.

- Küsel, U, 2011. Cultural Heritage Resources Impact Assessment of 2 x 132 Kv Power Lines from Praire B substation to Witkloof and 2 x 132 Kv Power lines from Praire B substation to Machadodorp Mpumalanga Province

One stone walled site and one quarry were located. The archaeological site investigated is a Late Iron Age site of the Badfontein type of stonewalling associated with the Koni (Huffman 2007: 448 & Esterhuysen 2007: 41 – 61) and possible Kgotlwe settlements which occur all along the eastern escarpment. The site is also similar to the sites recorded along the Nkomati power line route which are just east of this site (Küsel U.S. 2011). The quarries represent the 1890/1930 period to supply

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building material for houses etc. At the same time farmers workers re-used stonewalls for building purposes.

- Küsel, U, 2012. Cultural Heritage Resources Impact Assessment of the proposed new power lines for Nkomati Machadodorp, Mpumalanga Province.

The sites recorded fall within two categories. Two historic sites associated with white farmers. Six sites are Koni Late Iron Age sites. Koni is the name given by Sotho – Tswana people for people of Nguni origin. The people south of the Springbok flats are known as Southern Ndebele and those North of the Springbok flats as Northern Ndebele. The Northern Ndebele claim Langa as their legendary leader. These who adopted Sotho – Tswana are known as Koni (Huffman 2004).

- Murimbika, M.E. 2006. Phase 1 Cultural and Archaeological Heritage Assessment Specialist Study: Proposed Eskom Power Line Project from Machadodorp to Dullstroom and Substation Construction at Dullstroom in Enkangala District Municipality, Mpumalanga. For Limpopo Water Initiative.

No archaeological, historical or any other physical cultural heritage properties of significance were identified.

- Tomose, N. G. 2012. Heritage impact assessment study for the proposed Machadodorp PV solar facility on portion 8 of the farm De Kroon Machadodorp 368 JT, Emakhazeni Local Municipality, Mpumalanga Province, South Africa. For Savannah Environmental.

No Heritage sites were located.

- Van Wyk Rowe, C. 2012. Phase 1 Archaeological/Heritage Impact Assessment for the Proposed Boarding School: Remainder of Portion 8 of the Farm Rietfontein 365 JT, Machadodorp, Mpumalanga. For Wandima Environmental Services.

One archaeological feature (a circular stone walled enclosure) situated near a rocky outcrop was identified on the south-western border of the study area.

4.2.3 Heritage screening

A heritage screening report was compiled by the Department of Environmental Affairs National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental

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Impact Assessment Regulations 2014, as amended. According to the heritage screening report, the project area has a Low Heritage Sensitivity (**Figure 8**). The fieldwork has shown that no archaeological and heritage resources were present in the area and thus concur with the original screening rating. The screening for Palaeontological resources has a very high sensitivity



Screening Report Map

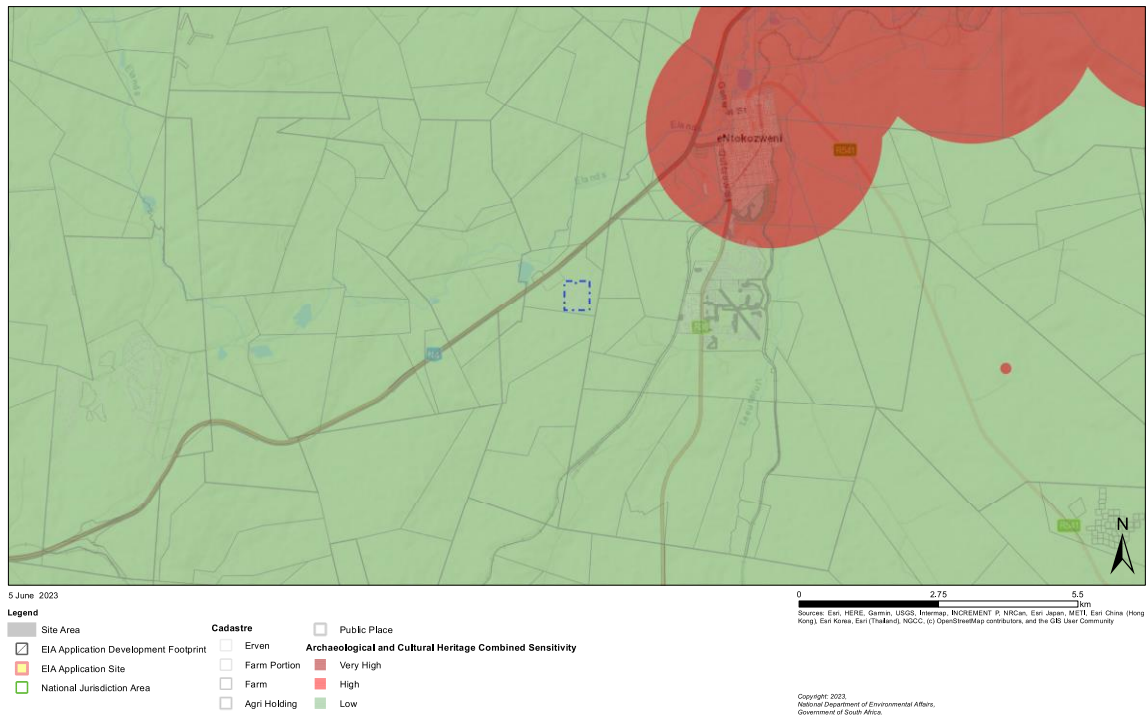


Figure 8 - Screening tool map indicating a low sensitivity rating for archaeology and heritage

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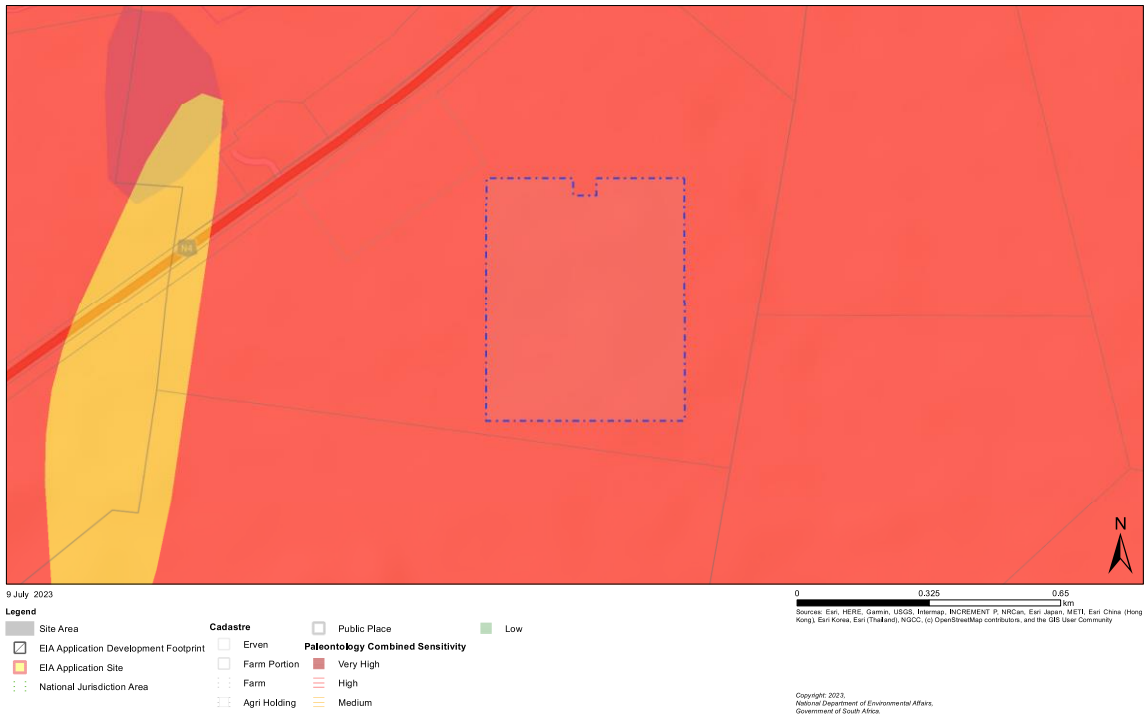


Figure 9 – Screening tool map indicating a very high sensitivity rating for Palaeontology



Figure 10 – SAHRIS 1 in 250 000 geological formation layer indicating sensitivity as deemed by SAHRIS

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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.

Figure 11 - SAHRIS legend for palaeontology sensitivity

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4.2.4 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 study area 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. The analysis of the studies conducted in the area 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 foot hill	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 findings¹

The fieldwork was conducted on the 8th of June 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 12**.

During the fieldwork NO heritage features or resources were identified.

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.

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4.4 Palaeontology

The original report completed by Vilikazi (2012) indicated that the site is underlain by geology from the Precambrian period that is not rich in fossils. *It is unlikely that excavation during the construction phase may uncover an abundance of previously unknown or undiscovered fossils.*

Therefore, the proposed development of the photovoltaic installations has a small footprint, and the sensitivity of these sedimentary rocks ranges from low to zero. The above mentioned reasons, therefore, suggest that no further paleontological studies are recommended for this development.

The above findings remain true for the present as the site and project have not changed in extent or layout from the original 2012 assessment.

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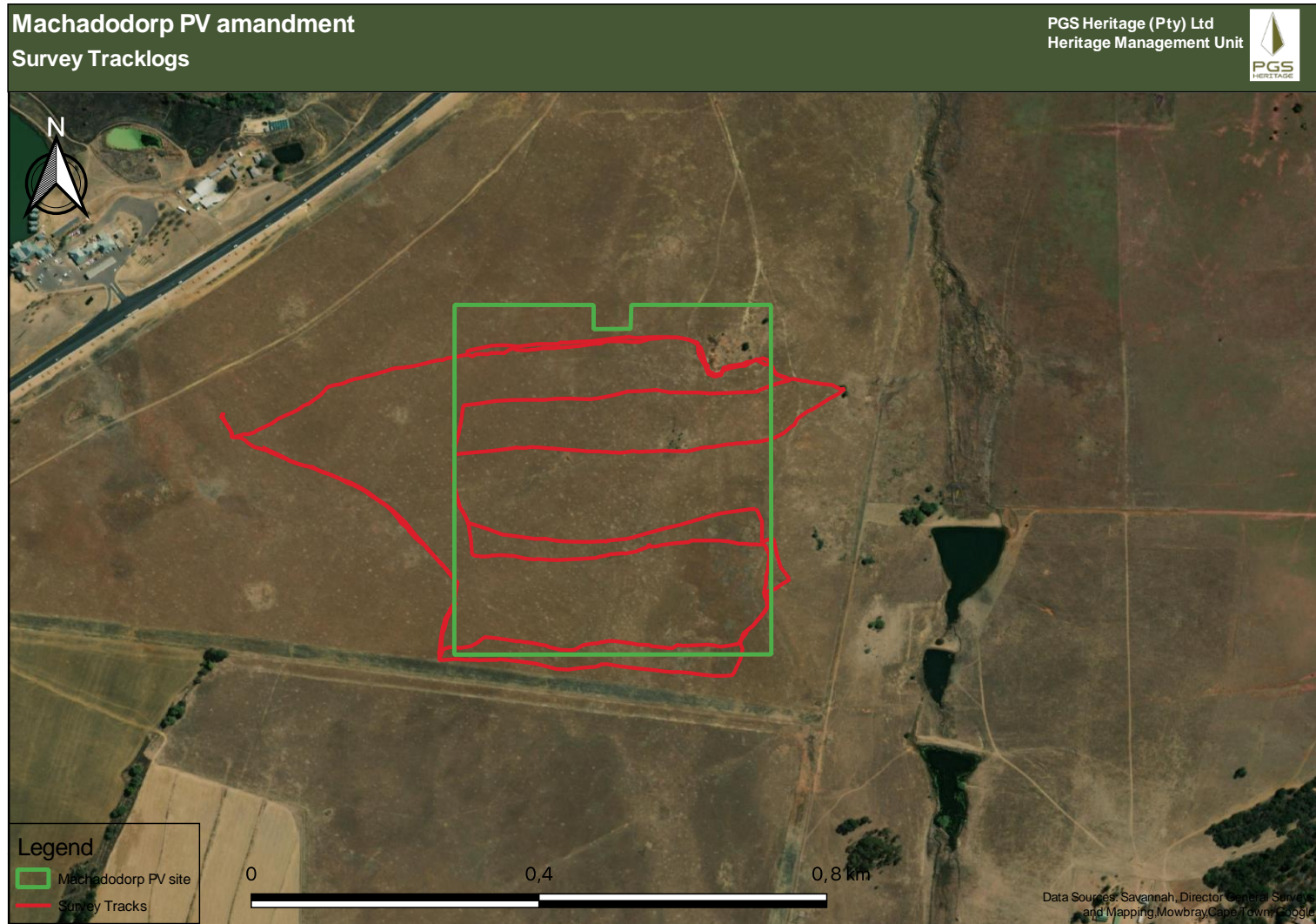


Figure 12 - Fieldwork tracklogs (track in red, study area in green)

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5 IMPACT ASSESSMENT

The impact assessment rating is based on the rating scale as contained in **Appendix B**. However, as no heritage resources were located, no impact on heritage resources will occur within the Machadodorp PV assessment area.

5.1 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 from the project.

5.1.1 *Burial grounds and graves*

No Burial grounds were located.

5.1.2 *Historical Structures*

No historical structures were located.

5.1.3 *Archaeological resources*

No archaeological resources were located.

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6 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

The following section must be read in conjunction with **Table 7** of this report.

6.1 Construction and operational phases

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

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

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

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

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6.3 Possible finds during construction

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

- Historical structures and foundations
- unmarked burial grounds and graves

6.4 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 6** gives guidelines for lead times on permitting.

Table 6: 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

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6.5 Heritage Management Plan for EMPr implementation

Table 7: Heritage Management Plan for EMPr implementation

Area	Mitigation measures	Phase	Timeframe	The responsible party for 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.	Construction	During construction	Applicant ECO Heritage Specialist	ECO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34-36 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 mitigation can be carry out by a palaeontologist	Construction	During Construction	Applicant Environmental Control Officer (ECO)	Monthly	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report

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7 CONCLUSIONS AND RECOMMENDATIONS

The HIA identified NO heritage resources within the study area, NO further mitigation work is required before the project can continue.

The findings of the original 2012 HIA and Palaeontological study is confirmed and it is the combined considered opinion of the heritage specialists that the proposed project will have no impact on heritage resources.

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VAN WYK ROWE, C. 2012. A Phase 1 Archaeological and Heritage Impact Assessment for the Proposed Boarding School, Remainder of Portion 8 of the Farm Rietfontein365 JT, Machadodorp, Mpumalanga Province.

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8.4 Google Earth

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**APPENDIX A
ENVIRONMENTAL IMPACT METHODOLOGY**

PGS: IMPACT ASSESSMENT METHODOLOGY



**PGS
HERITAGE**

**HERITAGE IMPACT ASSESSMENT
OPERATING PROCEDURE
PGS PJ MAN 007 02**

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1. Impact Assessment Methodology

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

Significance;
 Spatial scale;
 Temporal scale;
 Probability; and
 Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the criteria is given in **Table 8**.

Table 8: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	Proposed site	Incidental
2	LOW	Study area	Short-term
3	MODERATE	Local	Medium/High-term
4	HIGH	Regional / Provincial	Long-term
5	VERY HIGH	Global / National	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

1.1. Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km²) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would

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be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 9 below.

Table 9: Description of the significance rating scale

RATING		DESCRIPTION
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

1.2. Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 10**.

Table 10: Description of the significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 10 km from the proposed site.
2	Study Site	The impact will affect an area not exceeding the Eskom property.
1	Proposed site	The impact will affect an area no bigger than the ash disposal site.

1.3. Duration Scale

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In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 11**.

Table 11: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium/High term	The environmental impact identified will operate for the duration of life of facility.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

1.4. Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in **Table 12** below.

Table 12: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

1.5. Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard “degree of certainty” scale is used as discussed in **Table 13**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 13: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.
Don't know	The consultant cannot, or is unwilling, to make an assessment given available information.

1.6. Quantitative Description of Impacts

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To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\text{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \text{Spatial} + \text{Temporal}) \times \text{Probability}}{3 \times 5}$$

An example of how this rating scale is applied is shown in **Table 14**.

Table 14: Example of Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
	LOW	Local	Medium/High-term	Could Happen	
Impact to air	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the **Table 15** below.

Table 15: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

An example of how this rating scale is applied is shown below in Table 15.

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Table 16: Example of Rating Scale

IMPACT	IMPACT DIRECTION	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Heritage	Negative	Very low	Isolated sites	Permanent	Has happened	
	-	1	1	5	5	2.33

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APPENDIX B
PGS TEAM CVS

PROFESSIONAL CURRICULUM VITAE FOR JESSICA ANGEL
Professional Archaeologist for PGS Heritage

Personal Details

- **Name:** Jessica
- **Surname:** Angel
- **Date of Birth:** 25-12-1983
- **Citizenship:** South African
- **Gender:** Female
- **Marital Status:** Single
- **Languages Spoken:** English and Afrikaans
- **Drivers Licence** Code B – competent 4x4 driver
- **First Aid** (Level 1)
- **Snake Handling and snake bite first aid** (March 2019. African Snakebite Institute – Johan Marias)

Education History

- **2002:** Matriculated from Northcliff High School with the following subjects: English, Afrikaans, Mathematics, Science, Biology and Art.
- **2005:** Completed BA at University of the Witwatersrand with Geography and Archaeology Majors.
- **2006:** Completed BSc Hons (Geography) at the University of the Witwatersrand with the following subjects: Environmental Management, Advanced Geographic Information Systems (GIS), Paleogeomorphology and Globalisation and Agro Food Restructuring.
- **2009 – 2013:** M.Sc Archaeology and Geography, with thesis title: *Mpumalanga Late Iron Age: Incorporating Geographic Information Systems (GIS) and Archaeological Data to Better Understand Spatial and Temporal Distribution of Past Societies.* (Graduated March 2014).

Employment History

- **2015 – current:** Senior Archaeologist – PGS Heritage
- **2012-2013:** Basic internship at PGS. Duties include gaining familiarity with gathering relevant background data, field surveys, exhumations and report writing.
- **2013:** Heritage work at NGT. Background research, report writing and ground surveys.

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- **2011:** Research Assistant: GIS work for Prof Karim Sadr. Duties include: Google Earth survey work and digitising. (Sadr, K & Rodier, X. 2012. Google Earth, GIS and stone-walled structures in southern Gauteng, South Africa. *Journal of Archaeological Science* xxx: 1-9)

Experience in the field of archaeology:

2012:

- First Phase Heritage Assessment. Belfast, Mpumalanga
- First Phase Heritage Assessment. Delareyville, Stone Age survey
- Heritage Assessment. Belfast Mpumalanga, Ndebele initiation site.

2013:

- Second Phase Impact Assessment. Pretoria East, Gauteng. Documentation and mapping the layout of an Iron Age site.
- Final Phase Impact Assessment. Grave Exhumation. Chlorkop, Gauteng
- First Phase Heritage Assessment. Belfast, Mpumalanga. Exxaro Paardeplaats Project.
- Grave Exhumation. Mafikeng. University of Pretoria research.
- First Phase Heritage Assessment. Port Nolloth, Namaqualand. Powerline.

2015

- Heritage inventory of the Ekuruleni area for Auracon
- Heritage Impact assessment, Heilbron, Freestate
- Second Phase Heritage Impact assessment. Documentation of an Iron age site, Rustenburg.
- Heritage Impact Assessment. Proposed Mining of the farm Zandvoort 10. Carolina, Mpumalanga. (SAHRIS CaseID:11952)
- Heritage Impact Assessment. The Rand en Dal Ext13 proposed development on Portion 29 of the Farm Paardeplaats117 IQ, Krugersdorp, Gauteng. (SAHRIS CaseID:7176)
- Heritage Impact Assessment. Proposed Jeanette Project. Welkom, Freestate.
- Heritage Impact Assessment. Proposed Sendawo 75MW Solar Photovoltaic (PV) Energy Facility. Vryburg, North West Province. (SAHRIS CaseID:9116)
- Heritage Impact Assessment. Proposed Tlisitseng 75MW Solar Photovoltaic (PV) Energy Facility. Lichtenburg, North West Province. (SAHRIS CaseID:9119)
- Second Phase Heritage Mitigation. Clanwilliam Dam Project. Clanwilliam, Western Cape. Heritage management and mitigation of 90 archaeological and historical sites that are to be impacted by the Raising of the Clanwilliam Dam wall. (Collections manager: three year contract).

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2016

- Heritage Impact Assessment. Proposed Ngwedi Loop. Rustenburg, North West Province
- Heritage Impact Assessment. Proposed N2 Bypass. Butterworth, Eastern Cape
- Heritage Impact. Sibanye Gold Proposed PV Plant. Westonaria, Gauteng
- Heritage Impact Assessment. Proposed City Parks Wetlands. Middle Soweto, Gauteng.
- Heritage Impact Assessment. Proposed Newtown Development. Pilgrimsrest, Mpumalanga.
- Heritage Impact Assessment. Proposed development of the Platberg Wind Energy Facility and supporting electrical infrastructure. Victoria West, Northern Cape. (SAHRIS CaseID:9301)
- Heritage Impact Assessment. Proposed Aletta and Eureka Wind Energy Facility (WEF). Copperton, Northern Cape. (SAHRIS CaseID:9810)
- Heritage Impact Assessment. Proposed upgrade of the Newlands Bulk Water Supply Scheme. East London, Eastern Cape.
- Heritage Impact Assessment, Leeuwbosch 44, Leeudoringstad, North West Province. Proposed construction of the 5MW Solar Photovoltaic (PV) Power Plant. (SAHRIS CaseID:10407)
- Heritage Impact Assessment, Wildebeestkuil 59, Leeudoringstad, North West Province. Proposed construction of the 5MW Solar Photovoltaic (PV) Power Plant.
- Heritage Impact Assessment. Proposed development of four Leeuwerberg Wind Farms for the Associated Grid Connection near Loeriesfontein, Northern Cape Province. (SAHRIS CaseID:12081, 12082, 12078, 12077)
- Heritage Fatal Flaw Assessment, for the inclusion in the Environmental Screening Investigation for the Proposed Arnot New Ash Disposal Facility, Mpumalanga.
- Heritage Walk Down and Management Plan. Upgrading of the 66KV Network to a 132KV Network in the Hotazel, Kuruman and Kathu Area, Northern Cape Province. Post Authorisation Walkdown from Mothibistad Substation to Sekgame Switching Station. (SAHRIS CaseID:11967)
- Heritage Screening of Portion 9 of the Farm Grootfontein 394 JR, Tswane, Gauteng.
- Second Phase Heritage Mitigation. Mitigation work required with respect to the heritage find PGS06 on the remainder of the farm number 469, Hay District (Registration division), Tsantsabane Local Municipality, Northern Cape Province, in respect to the ACWA Power Solar reserve, Redstone Solar Thermal Power Plant. (SAHRIS CaseID:10081)
- Second Phase Heritage Mitigation. Clanwilliam Dam Project. Continued from 2015

2017

- Heritage Impact Assessment for the Proposed Lanseria Outfall Sewer, Johannesburg. (SAHRIS CaseID:11397)
- Heritage Study. Proposed opencast Mining on the Farm Kwaggafontein 8 IT, near Carolina, Mpumalanga Province. (SAHRIS CaseID:11952)

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- Heritage Impact Assessment for the Proposed K60 Road Development, Rabie Ridge Gauteng.
- Heritage Impact Assessment. Kimberly Ekapa Mining Joint Venture 2.8 Slimes Pipeline Project, Kimberly, Northern Cape Province.
- Heritage Screening and Site Assessment. MTK 39/2015/16 Mintek Derelict and Ownerless Mines Rehabilitation Programme 2016-2019. Msauli Mine, Steelpoort Mine, Penge Mine, Langerdraai Mine and Uitkuik Mine.
- Heritage Impact Assessment. Proposed Phalandwa Extension Mine, Delmas, Mpumalanga.
- Site Assessment and Heritage Screening. Wadeville Extension 51. Township establishment and associated infrastructure development on Portion 273 and the remaining extent of Portion 267 on the Farm Klippoortjie 110 – IR. Ekurhuleni, Gauteng.
- Site assessment and Heritage Scoping. Proposed eMakhazeni Project near Belfast, Mpumalanga. (SAHRIS CaseID:12316)
- Heritage Impact Assessment. Proposed extension of the mining operations at the existing Ilima Colliery (Old Pembani Colliery), Near Carolina, Mpumalanga. (SAHRIS CaseID:12793)
- Heritage Impact Assessment. Proposed Mlonzi Golf Estate and Hotel, near Lusikisiki, Eastern Cape.
- Second Phase Heritage Mitigation. Clanwilliam Dam Project. Continued from 2015

2018

- Heritage Impact Assessment. Proposed Extension of the Mining Operations at the Existing Manungu Colliery, near Delmas, Mpumalanga.
- Heritage Impact Assessment. Proposed Mashishing Housing Development, Lydenburg, Mpumalanga. (SAHRIS CaseID:12999)
- Heritage Impact Assessment. Phase 1B1 Thornhill Housing Development, Port Alfred, Eastern Cape Province.
- Heritage Impact Assessment. Target to Freddie's Pipeline, Allanridge, Free State.
- Heritage Impact Assessment. Proposed Leslie Coal Mine near Leandra, Mpumalanga. (SAHRIS CaseID:12399)

2020

- Coega Zone 10, Coega IDZ, Eastern Cape Province. Colonial Period Phase 2 Mitigation Archaeological Excavation

2018 to 2023

- Presently employed on the Polihali Dam Project in Lesotho as Collections Manager (5 year contract).

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The Polihali Dam Project is a 2nd Phase CRM operation in mitigation of total inundation of a range of cultural sites, including extant, historical and Stone Age sites. Nine (9) APC and thirty one (31) LSA sites are earmarked for detailed survey and excavation.

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SHANNON HARDWICK

Professional Heritage Practitioner

PROFILE

Heritage Specialist with a Master's degree in Archaeology and registered with the Association of Southern African Professional Archaeologists as a Professional Archaeologist. I am further registered with the International Council on Monuments and Sites and International Association for Impact Assessments South Africa.

My work focuses on supporting the Grave Relocations Unit in implementing Grave Relocation Processes as a mitigation measure to avoid impacts to these heritage resources in compliance with the applicable legislation.

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EDUCATION

University of the Witwatersrand

2007-2009
Bachelor of Science (BSc) - Majors in Archaeology and Geography

University of the Witwatersrand

2010
Bachelor of Science with Honours (BSc Hons) in Archaeology

University of the Witwatersrand

2011-2013
Master of Science (MSc) in Archaeology

University of Cape Town

2019
Continued Professional Development Program - Heritage Resources Management Short Course

WORK EXPERIENCE

PGS Heritage

Senior Archaeologist – Grave Relocations Manager

2023- present
Heritage specialist responsible for supporting the Grave Relocations Unit in completing Grave Relocation Processes from engaging stakeholders to exhumations and reburials including the permitting and reporting.

Digby Wells Environmental – Team Lead: Heritage

2022-2023
Technical specialist responsible for supporting the department manager and team in carrying out their various duties while meeting responsibilities of a heritage consultant (below).

Digby Wells Environmental – Heritage Consultant

2017-2022
Heritage specialist responsible for heritage and archaeological impact studies, the implementation of recommended mitigation measures or management strategies and project management.

Digby Wells Environmental – Heritage and Social Intern

2017

Department of Geography, Archaeology and Environmental Science (University of the Witwatersrand) – Teaching Assistant

2013-2016

PROFESSIONAL AFFILIATION

Association of Southern African Professional Archaeologists (ASAPA)
International Council on Monuments and Sites (ICOMOS)
International Association for Impact Assessments South Africa (IAIAsa)

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WOUTER FOURIE

Professional Heritage Practitioner

PROFILE

Project Manager and Principal Heritage Specialist holds a post-graduate degree in Archaeology and is registered with the Association of Southern African Professional Archaeologists 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 in South Africa.

My work focuses on heritage management through Heritage Impact Assessments, implementation of recommendations and large-scale heritage mitigation projects. I have worked, completed and implemented heritage projects in South Africa, Botswana, Mozambique, Mauritius, Zambia, Lesotho, and the Democratic Republic of the Congo.

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EDUCATION

University of Pretoria

1993-1996

BA Degree - Majors in Archaeology, Anthropology and Geography

University of Pretoria

1997

BA Hon Archaeology, with further specialisation in environmental management.

University of Cape Town

2016 - present

MPhil Conservation of the Built Environment

WORK EXPERIENCE

PGS Heritage Group of Companies

(South Africa, Lesotho, Mozambique, and Portugal)

Director – Heritage Specialist

2003- present

I am actively involved in the management of the business and focus on marketing and new business for PGS, specifically the broader SADC region. Acting as heritage specialist in multidisciplinary teams

The University of the Witwatersrand - Project Manager – Archaeological Contracts Unit

2007-2008

Responsible for conducting heritage and archaeological impact studies, archaeological excavations and general management of the unit

Matakoma Consultants – Director – Heritage Specialist

2000 – 2008

Heritage specialist and Director responsible for heritage and archaeological impact studies

Randfontein Estate Gold Mine – Environmental Coordinator

Oct 1998- Feb 2000

Coordinating all environmental Rehabilitation work

Department of Minerals and Energy Environmental Officer

Oct 1997– Sept 1998

PROFESSIONAL AFFILIATION

Accredited Professional Heritage Practitioner

Association of Professional Heritage Practitioners
Since 2014

Accredited Professional Archaeologist

Association of Southern African Professional Archaeologists –
Since 2001