# Appendix G.8

## HERITAGE REPORT

# HERITAGE IMPACT ASSESSMENT

**(REQUIRED UNDER SECTION 38(8) OF THE NHRA (No. 25 OF 1999)**

**FOR THE PROPOSED PHEFUMULA EMOYENI ONE UP TO 400KV GRID CONNECTION AND MTS, MPUMALANGA**

**Type of development:**

Grid Connection

**Client:**

WSP Group Africa (Pty) Ltd

**Applicant:**

Phefumula Emoyeni One (Pty) Ltd

**Report Prepared by:**


**Beyond Heritage**
Private Bag X 1049
Suite 34
Modimolle
0510
Tel: 082 974 6301
Fax: 086 691 6461
E-Mail: info@heritageconsultants.co.za



Report Author:
Ms. L. Kraljević
Project Reference:
Project number 24236B
Report date:
February 2025

## APPROVAL PAGE

| | |
|---|---|
| **Project Name** | Phefumula Emoyeni One Grid Connection |
| **Report Title** | Heritage Impact Assessment for the proposed Phefumula Emoyeni One Up to 400kV Grid Connection and MTS, Mpumalanga |
| **Authority Reference Number** | 14/12/16/3/3/2/2596 |
| **Report Status** | Final Report |
| **Applicant Name** | Phefumula Emoyeni One (Pty) Ltd |

| Responsibility | Name | Qualifications and Certifications | Date |
|---|---|---|---|
| **Fieldwork** | Ruan van der Merwe - Archaeologist | Hons Archaeology ASAPA #667 | May 2024 & February 2025 |
| **Fieldwork** | Hannes Visser – Archaeologist | BA Hons Archaeology ASAPA #617 | February 2025 |
| **Report writing and archaeological support** | Lara Kraljević - Archaeologist | MA Archaeology ASAPA #661 | October 2024 |
| **Palaeontological Report** | Prof Marion Bamford | PhD Palaeobotany | October 2024 |

## DOCUMENT PROGRESS

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| Date | Report Reference Number | Description of Amendment |
|---|---|---|
| 10 February 2025 | 24236B | Layout Changes |
| | | |

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## REPORT OUTLINE

Appendix 6 of the GNR 326 EIA Regulations published on 7 April 2017 provides the requirements for specialist reports undertaken as part of the Environmental Authorisation process. In line with this, Table 1 provides an overview of Appendix 6 together with information on how these requirements have been met.

**Table 1. Specialist Report Requirements.**

| Requirement from Appendix 6 of GN 326 EIA Regulation 2017 | Chapter |
|---|---|
| (a) Details of -<br>(i) the specialist who prepared the report; and<br>(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae. | Section a |
| (b) Declaration that the specialist is independent in a form as may be specified by the competent authority. | *Declaration of Independence* |
| (c) Indication of the scope of, and the purpose for which, the report was prepared. | Section 1 |
| (cA) An indication of the quality and age of base data used for the specialist report. | Section 3.4. |
| (cB) A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change. | Section 9 |
| (d) Duration, Date and season of the site investigation and the relevance of the season to the outcome of the assessment. | Section 3.4 |
| (e) Description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used. | Section 3 |
| (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 site plan identifying site alternatives. | Section 7, 8 and 9 |
| (g) Identification of any areas to be avoided, including buffers. | Section 7,8 and 9 |
| (h) 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 8 |
| (I) Description of any assumptions made and any uncertainties or gaps in knowledge. | Section 3.7 |
| (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 or activities. | Section 1.3 |
| (k) Mitigation measures for inclusion in the EMPr. | Section 9.1 and 9.5 |
| (l) Conditions for inclusion in the environmental authorisation. | Section 9. 1 and 9.5 |
| (m) Monitoring requirements for inclusion in the EMPr or environmental authorisation. | Section 9.6 |
| (n) Reasoned opinion -<br>(i) As to whether the proposed activity, activities or portions thereof should be authorised;<br>(iA) Regarding the acceptability of the proposed activity or activities; and<br>(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 9.3 |
| (o) Description of any consultation process that was undertaken during the course of preparing the specialist report. | Section 5 |
| (p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto. | Refer to the EIA report |
| (q) Any other information requested by the competent authority. | No other information requested at this time |

## Executive Summary

Phefumula Emoyeni One (Pty) Ltd, is proposing to develop the Phefumula Emoyeni One Wind Energy Facility (WEF) to be integrated to the national Grid with a 400kV grid connection and establishing a new 400/132kV Main Transmission Substation (MTS) as well as three distribution substations / switching stations in order to support the Phefumula Emoyeni One WEF. The project will be located approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa. Phefumula Emoyeni One (Pty) Ltd, appointed WSP Group Africa (Pty) Ltd as the independent environmental assessment practitioner (EAP) to apply for Environmental Authorization for the Project. WSP Group Africa (Pty) Ltd, in turn, appointed Beyond Heritage to conduct a Heritage Impact Assessment (HIA) for the Project and the study area was assessed through a desktop assessment and by a non-intrusive pedestrian field survey. Key findings of the assessment include:

- The Project area is situated within a large, open landscape of which large sections have been used for agricultural activities as well as cattle farming. Many farmsteads are also situated throughout the larger Project area, with some still occupied.
- Based on the finalised layout of the Project additional field work was done and newly recorded sites within the Grid Infrastructure includes a burial site (PFM001), Historical farmsteads (PFM002, PFM009, PFM010), Historical settlement (PFM005) were recorded;
- These sites in addition to previously recorded Historical Farmstead PF027, are situated within the OHL corridors;
- According to the South African Heritage Resource Authority (SAHRA) Paleontological sensitivity map the study area is of insignificant, and very high palaeontological sensitivity. Bamford (2024) concluded that it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary. There is a very small chance that fossils may occur in below the soils in the unweathered mudstones, siltstones and shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr.

The impact on heritage resources can be mitigated to an acceptable level, and the Project can be authorised provided that the recommendations in this report are adhered to and based on the SAHRA's approval.

### Recommendations:

The following recommendations for Environmental Authorisation apply and the Project may only proceed after receiving comment from SAHRA:

- Burial site PFM001 which lies within OHL Corridor 2 must be avoided with a 30m buffer zone;
- Historical farmsteads and structures PFM002, PFM005, PFM009, PFM010, PF027 must be avoided with a 30m buffer zone;
- All sites of medium and high significance which will not be impacted should be added to development plans and avoided with a 30m buffer zone;
- Development activities must be confined to the approved development footprint only;
- Monitoring of the Project area by the ECO during pre-construction and construction phases for heritage and palaeontology chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9.

**Declaration of Independence**

| | |
|---|---|
| **Specialist Name** | Lara Lucija Kraljević |
| **Declaration of Independence** | I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 107 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations (as amended), that I:<br>• I act as an independent specialist in this application;<br>• 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;<br>• I declare that there are no circumstances that may compromise my objectivity in performing such work;<br>• I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;<br>• I will comply with the Act, Regulations and all other applicable legislation;<br>• I have no, and will not engage in, conflicting interests in the undertaking of the activity;<br>• 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;<br>• All the particulars furnished by me in this form are true and correct; and<br>• I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 49 A of the Act. |
| **Signature** |  |
| **Date** | 10/02/2025 |

### 1.1 Expertise of the specialist

Lara Kraljević completed her masters in archaeology at the University of Pretoria specialising in chemical and mineralogical studies of Iron Age ceramics. Lara is an accredited member of the Association of South African Professional Archaeologists (ASAPA) (#661). She has co-authored over 100 impact assessments in Gauteng, Limpopo, Mpumalanga, Northern Cape, Eastern Cape, and North West Provinces in South Africa.

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## ABBREVIATIONS

| | |
|---|---|
| ASAPA | Association of South African Professional Archaeologists |
| BGG | Burial Ground and Graves |
| CFPs | Chance Find Procedures |
| CMP | Conservation Management Plan |
| CoGHSTA | Co-operative Governance, Human Settlements and Traditional Affairs |
| CRR | Comments and Response Report |
| CRM | Cultural Resource Management |
| DFFE | Department of Fisheries, Forestry and Environment, |
| EA | Environmental Authorisation |
| EAP | Environmental Assessment Practitioner |
| ECO | Environmental Control Officer |
| EIA | Environmental Impact Assessment* |
| EIA | Early Iron Age* |
| EAP | Environmental Assessment Practitioner |
| EMPr | Environmental Management Programme |
| ESA | Early Stone Age |
| ESIA | Environmental and Social Impact Assessment |
| GIS | Geographical Information System |
| GPS | Global Positioning System |
| GRP | Grave Relocation Plan |
| HIA | Heritage Impact Assessment |
| LIA | Late Iron Age |
| LSA | Late Stone Age |
| MEC | Member of the Executive Council |
| MIA | Middle Iron Age |
| MPRDA | Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) |
| MSA | Middle Stone Age |
| NCHM | National Cultural History Museum |
| NEMA | National Environmental Management Act, 1998 (Act No. 107 of 1998) |
| NHRA | National Heritage Resources Act, 1999 (Act No. 25 of 1999) |
| NID | Notification of Intent to Develop |
| NoK | Next-of-Kin |
| PRHA | Provincial Heritage Resource Agency |
| SADC | Southern African Development Community |
| SAHRA | South African Heritage Resources Agency |

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

## GLOSSARY

| | |
|---|---|
| Archaeological site | Remains of human activity over 100 years old |
| Earlier Stone Age | ~ 2.6 million to 250 000 years ago |
| Middle Stone Age | ~ 250 000 to 40-25 000 years ago |
| Later Stone Age | ~ 40-25 000, to the historic period |
| The Iron Age | ~ AD 400 to 1840 |
| Historic | ~ AD 1840 to 1950 |
| Historic building | Over 60 years old |

## 2 Introduction

WSP Group Africa (Pty) Ltd, appointed Beyond Heritage to conduct a Heritage Impact Assessment (HIA) for the proposed Phefumula Emoyeni One Wind Energy Facility (WEF) to be integrated to the national Grid with a 400kV grid connection and establishing a new 400/132kV Main Transmission Substation (MTS) as well as three distribution substations / switching stations in order to support the Phefumula Emoyeni One WEF. The project will be located approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa. The grid will be located over 26 farm portions and will be approximately 36.37km (Figure 1.1 and 1.2). The report forms part of the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the development and informs the EIA phase of this process.

The aim of the study was to survey the proposed development footprint to understand the cultural layering of the area, and if heritage features are found, to assess their importance within local, provincial, and national context. It further served to assess the impact of the proposed Project on non-renewable heritage resources. The study will submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. Recommendations are included to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999) (NHRA).

The report outlines the approach and methodology utilized before and during the survey, which includes:

- Phase 1, review of relevant literature;
- Phase 2, the physical surveying of the area on foot and by vehicle;
- Phase 3, reporting the outcome of the study.

During the survey, multiple burial sites, farmsteads, ruins, and circular stone enclosures were recorded in the general study area. General site conditions and features in the study area were recorded by means of photographs, GPS locations and descriptions. Possible impacts were identified, and mitigation measures are proposed in this report.

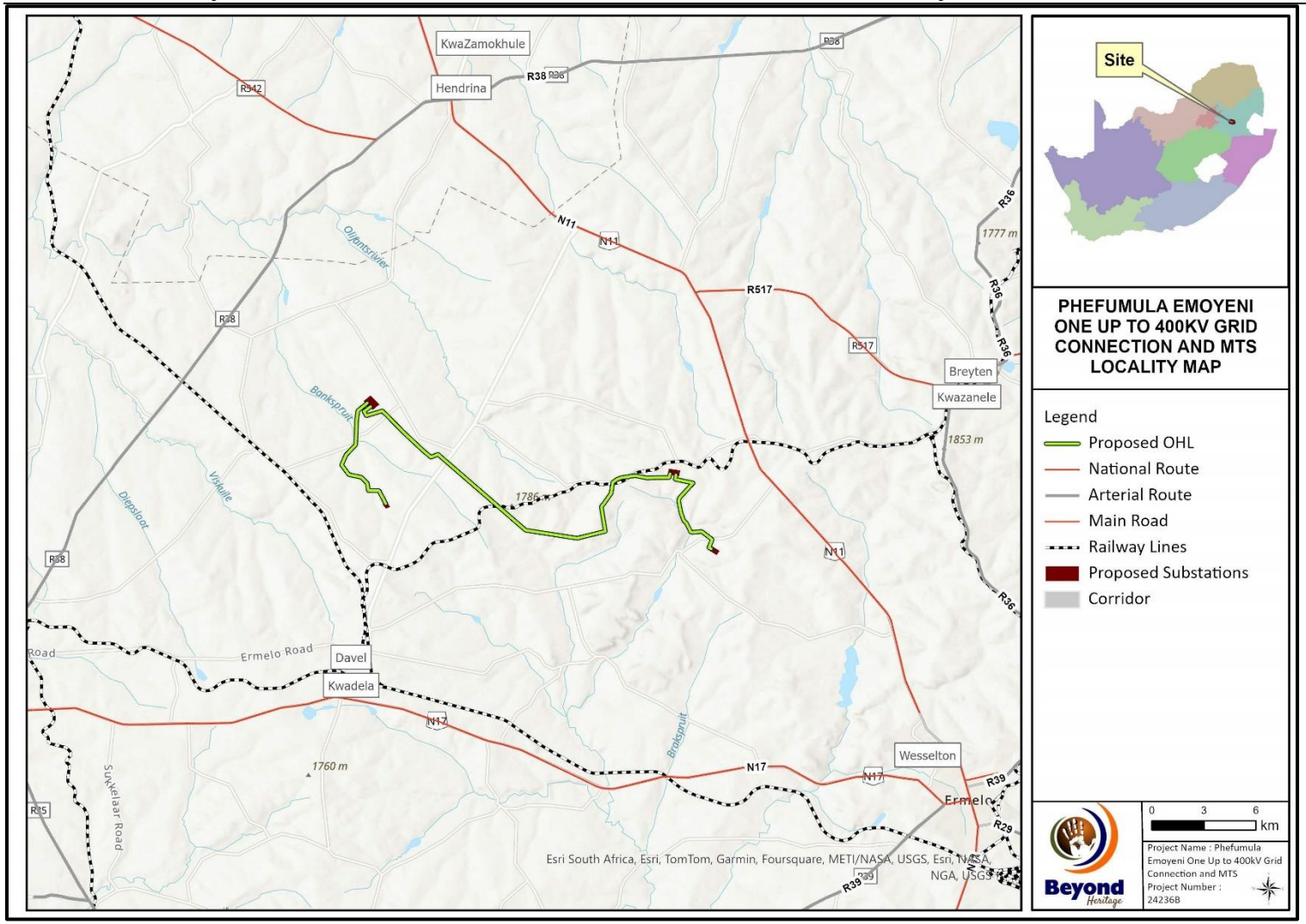



Figure 2.1.Local setting of the Project.

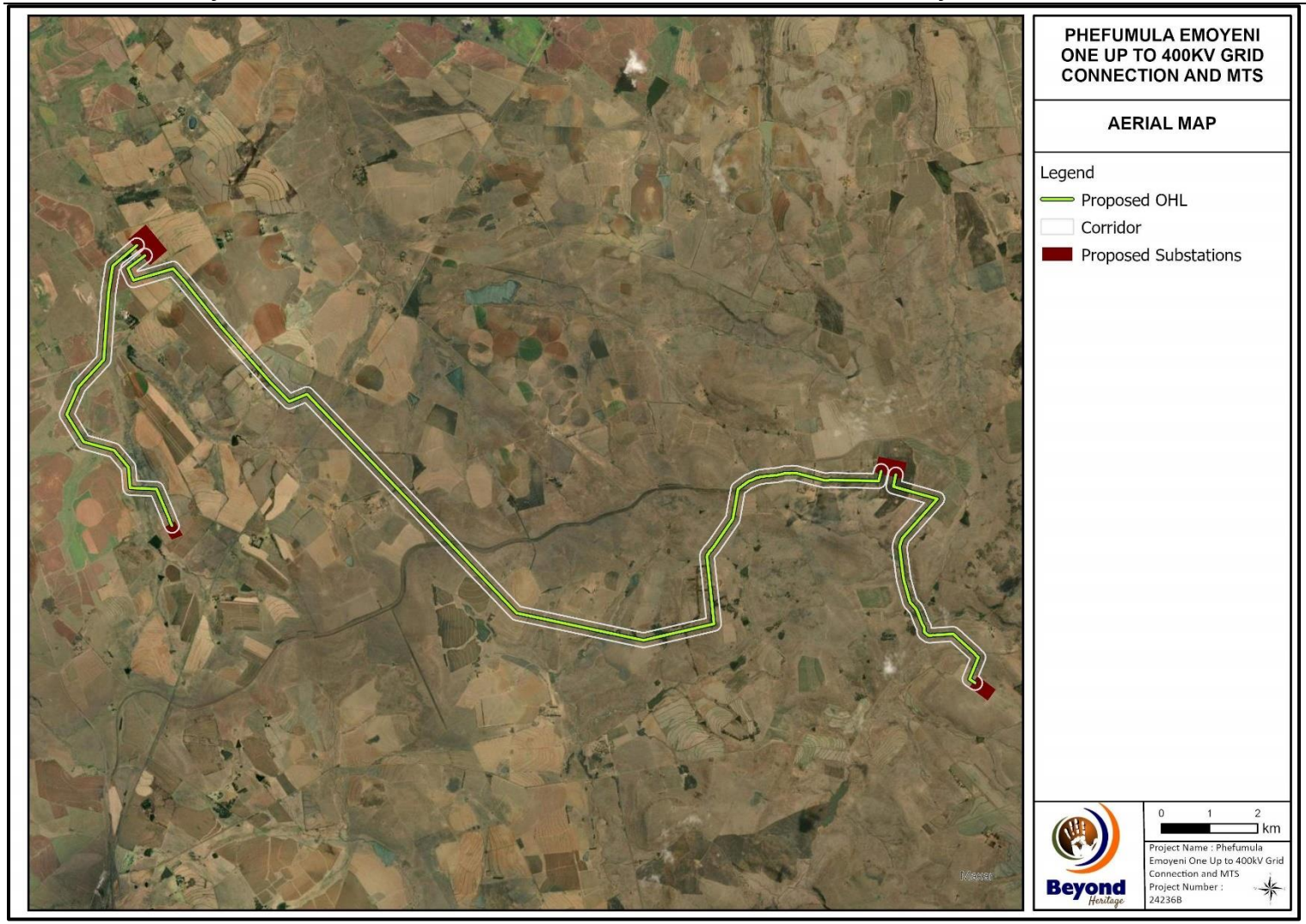



Figure 2.2. Aerial image of the Project area and surrounds.

## 2.1 Terms of Reference

The following Terms of Reference were adhered to in conducting this HIA.

**Field study**

Conduct a field study to: (a) survey the development footprint to understand the heritage character of the impact area; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources affected by the proposed development.

**Reporting**

Report on the identification of anticipated and cumulative impacts the operational units of the proposed Project activity may have on the identified heritage resources for all 3 phases of the project, i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with the relevant legislation, SAHRA minimum standards and the code of ethics and guidelines of Association of South African Professional Archaeologists (ASAPA).

Recommendations are provided to assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999).

## 2.2 Project Description

Project components and the location of the Phefumula Emoyeni One Up to 400kV Grid Connection and MTS, Mpumalanga Project are outlined in Tables 2 and 3.

**Table 2: Project Description**

| | |
|---|---|
| **Magisterial District** | Msukaligwa Local Municipality within the Gert Sibande District Municipality |
| **Central co-ordinates of the development** | 26°21'24.45"S<br>29°47'55.33"E |
| **1:50 000 Topographic Map Number** | 2629 BC & BD |

**Table 3: Infrastructure and project activities**

| PROPOSED INFRASTRUCTURE | DETAILS |
|---|---|
| Up to 400kV transmission line | • 400kV Loop-In-Loop-Out (LILO) OHL.<br>• Servitude width for 1 x up to 400kV transmission line is 60m for Loop-In-Loop-Out<br>• Height of 1 x 400kV power line structure is on average 48m but may reach up to 50m in exceptional circumstances depending on the complexity and slope of the terrain.<br>• Minimum conductor clearance is between 8.1 and 12.6m.<br>• Span length between pylon structures is typically up to 100 - 250m apart, depending on complexity and slope of terrain.<br>• For up to 400kV structures footprint sizes may vary depending on design type up to 110m² (10.5m by 10.5m), with concrete foundations of up to 80m² and depths reaching up to 3.5m typically depending on the number and design of the foundations (to be determined during the detailed design engineering phase). The actual number of structures required will vary according to the final route alignment determined.<br>• Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design.<br><br>For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:<br>• The minimum vertical clearance distance between the ground and the transmission line is 6.7m.<br>• The minimum vertical clearance to any fixed structure that does not form part of the transmission line is 9.4m - 11m.<br>• The minimum distance between an up to 400kV transmission line and an existing road is 60m – 120m (depending on the type of road).<br>• Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to. |
| Up to 132kV transmission lines | • The servitude width for 1x up to 132kV transmission line is 31m. A 300m corridor must be assessed (150m on either side of the centre line) to allow for micrositing. In the case of the |

| PROPOSED INFRASTRUCTURE | DETAILS |
|---|---|
| | Loop-In-Loop-Out alternative this servitude will apply to each of the two connecting power lines.<br>• The maximum height for an up to 132kV powerline structure is 40m.<br>• Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design.<br>• Pylon structures may require anchors with guywires or be anchorless.<br>• For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80m² (10m by 8m), with depths reaching up to 3.5m typically in a rectangular 'pad' shape.<br>• A working area of approximately 100m x 100m is needed for each of the proposed structures to be constructed. |
| Main Transmission substation (MTS)<br>(Approx. 31Ha) | • A high voltage substation yard to allow for multiple 132kV and 400kV feeder bays and transformers, with infrastructure to allow for step-up to 400kV as required.<br>• Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed.<br>• The control building, telecommunication infrastructure, oil dam(s) etc,<br>• Workshop and office area within the collector substation footprint,<br>• Fencing around the Substation<br>• All the access road infrastructure to and within the substation |
| Three Distribution Substations | • Dx1-approx.7.85Ha footprint<br>• Dx2- approx.20.45Ha footprint<br>• Dx3- approx.13.60Ha footprint |
| Temporary/ construction phase infrastructure | • Construction compound at the MTS (3ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.)<br>• 3 x construction compound / laydown areas, including site office of 3ha each at each of the Dx locations (150m x 200m each) (including conservancy tank for ablutions)<br>• Batch plant of 4-7 ha (unless a commercial source is used and concrete trucked to site, preferable to keep options open)<br>• Portable ablution facilities will be used along the powerline routes |

## 2.3 Alternatives

**No-Go Alternative**

The no-go alternative, i.e. the Phefumula Emoyeni One Electrical Grid Infrastructure will not be developed.

**Layout Alternative**

The preliminary layout (Alternative 1) considered in the scoping report was eliminated due to the sensitivity of the alignment. The grid layout was optimised to avoid these sensitivities and the Optimised layout (Alternative 2) was considered during the EIA phase. The area assessed allows for siting of the development to avoid impacts to heritage resources.

## 3 Legislative Requirements

The HIA, as a specialist study to the EIA, is required under the following legislation:

- National Heritage Resources Act ((NHRA), Act No. 25 of 1999)
- National Environmental Management Act ((NEMA), Act No. 107 of 1998 - Section 23(2)(b))

A Phase 1 HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of heritage specialist input is to:

- Identify any heritage resources, which may be affected;
- Assess the nature and degree of significance of such resources;
- Assess the negative and positive impact of the development on these resources; and
- Make recommendations for the appropriate heritage management (or avoidance) of these impacts.

The HIA should be submitted, as part of the impact assessment report or EMPr, to the Provincial Heritage Resource Agency (PHRA) or to The South African Heritage Resources Agency (SAHRA). SAHRA will ultimately be responsible for the evaluation of Phase 1 HIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 HIA reports and additional development information, as per the impact assessment report and/or EMPr, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 HIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

SAHRA as a commenting authority under section 38(8) of the NHRA require all environmental documents, compiled in support of an EA application as defined by the National Environmental Management Act (NEMA) (Act No 107 of 1998) to be submitted to SAHRA for commenting. Environmental Impact Assessment (EIA) Regulations section 40 (1) and (2). The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended) Upon submission to SAHRA the project will be automatically given a case number as reference. As such the EIA report and its appendices must be submitted to the case as well as the EMPr, once it's completed by the Environmental Assessment Practitioner (EAP).

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level). Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 HIAs are primarily concerned with the location and identification of heritage sites situated within a proposed development area. Identified sites should be assessed according to their significance (refer to Section 3.5). Relevant conservation or mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Section 3 of the NHRA distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- Its importance in/to the community, or pattern of South Africa's history;
- Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
- Sites of significance relating to the history of slavery in South Africa

Conservation or mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision-making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement. After mitigation of a site, a destruction permit must be applied for with SAHRA by the applicant before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36 and GNR 548 as well as the SAHRA BGG Policy 2020. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 of the National Heritage Resources Act (NHRA), as well as the National Health Act of 2003 and are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5]) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to SAHRA authorisation. If the grave is not situated inside a formal cemetery, but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws, set by the cemetery authority, must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925) re-instituted by Proclamation 109 of 17 June 1994 and implemented by CoGHSTA as well as the National Health Act 2003 and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the office of the relevant Provincial Premier. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. To handle and transport human remains, the institution conducting the relocation should be authorised under the National Health Act of 2003.

# 4 METHODOLOGY

## 4.1 Literature Review and background study

A brief survey of available literature was conducted to extract data and information on the area in question to provide general heritage context into which the development would be set. This literature search included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). Findings are included in Section 6.1 and 6.2.

## 4.2 Genealogical Society and Google Earth Monuments

Google Earth and 1:50 000 topographic maps of the area were utilised to identify possible places of heritage sensitivity might be located; these locations were marked and visited during the fieldwork phase. The database of the Genealogical Society of South Africa (GSSA) was consulted to collect data on any known graves in the area. Results are included in Section 6.3.

## 4.3 Public Consultation and Stakeholder Engagement:

Stakeholder engagement is a key component of any EIA process, it involves stakeholders interested in or affected by the proposed development. Stakeholders are provided with an opportunity to raise issues of concern (for the purposes of this report only heritage related issues will be included). The aim of the public consultation process undertaken by the EAP was to capture and address any issues raised by community members and other stakeholders. Results are included in Section 5 and the final EIA report.

### 4.4 Site Investigation

The aim of the site visit was to:

a) survey the proposed Project area to understand the heritage character of the area and to record, photograph and describe sites of archaeological, historical or cultural interest;

b) record GPS points of sites/areas identified as significant areas;

c) determine the levels of significance of the various types of heritage resources recorded in the Project area.

**Table 4: Site Investigation Details**

| | **Site Investigation** |
|---|---|
| Date | Week of 20 May 2022 and 5th – 7th February 2025 |
| Season | Winter – The overall archaeological visibility across the proposed project area was high in areas consisting of open veld. The grasses within the proposed project area have been grazed to a degree that visibility was high. Visibility across the agricultural landscape was however low due to high levels of surface disturbances such as ploughed fields. The Project layout changed after the survey was conducted and some areas have not been surveyed as a result. The heritage character of the Project area is however well understood (Figure 3.1). |

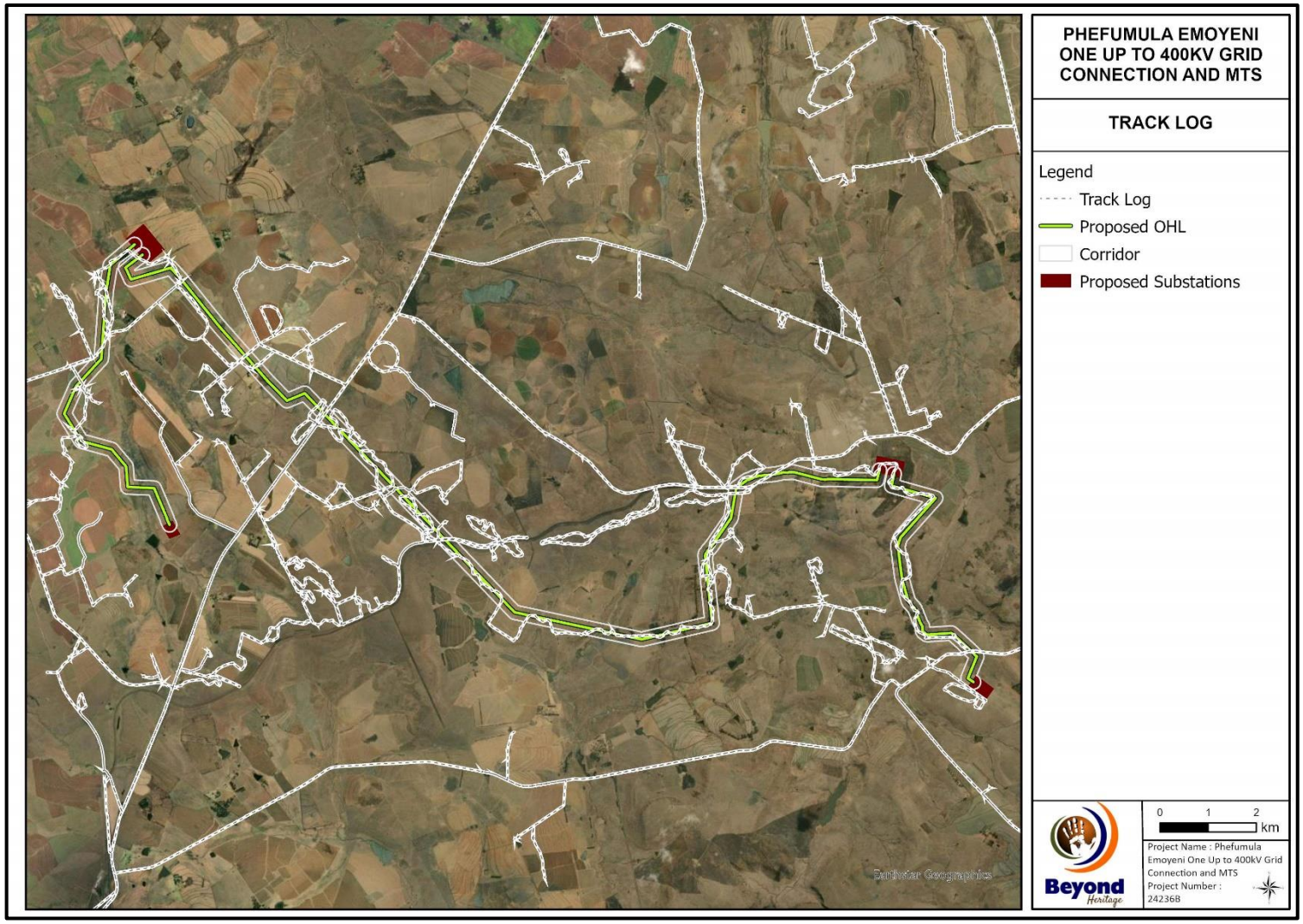



Figure 4.1. Tracklog of the survey path in white.

### 4.5 Site Significance and Field Rating

The presence and distribution of heritage resources define a ‘heritage landscape’. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire Project area, or a representative sample, depending on the nature of the project. In the case of the proposed Project the local extent of its impact necessitates a representative sample and only the footprint of the areas demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface. This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance with cognisance of Section 3 of the NHRA:

- The unique nature of a site;
- The integrity of the archaeological/cultural heritage deposits;
- The wider historic, archaeological and geographic context of the site;
- The location of the site in relation to other similar sites or features;
- The depth of the archaeological deposit (when it can be determined/is known);
- The preservation condition of the sites; and
- Potential to answer present research questions.

In addition to this criteria field ratings prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report. The recommendations for each site should be read in conjunction with section 9 of this report.

**Table 5. Heritage significance and field ratings**

| ***FIELD RATING*** | ***GRADE*** | ***SIGNIFICANCE*** | ***RECOMMENDED MITIGATION*** |
|---|---|---|---|
| National Significance (NS) | Grade 1 | - | Conservation; national site nomination |
| Provincial Significance (PS) | Grade 2 | - | Conservation; provincial site nomination |
| Local Significance (LS) | Grade 3A | High significance | Conservation; mitigation not advised |
| Local Significance (LS) | Grade 3B | High significance | Mitigation (part of site should be retained) |
| Generally Protected A (GP. A) | - | High/medium significance | Mitigation before destruction |
| Generally Protected B (GP. B) | - | Medium significance | Recording before destruction |
| Generally Protected C (GP.C) | - | Low significance | Destruction |

### 4.6 Impact Assessment Methodology

The criteria used to establish the impact rating on sites was provided by WSP Group Africa (Pty) Ltd:

| CRITERIA | SCORE 1 | SCORE 2 | SCORE 3 | SCORE 4 | SCORE 5 |
|---|---|---|---|---|---|
| **Impact Magnitude (M)** The degree of alteration of the affected environmental receptor | Very low: No impact on processes | Low: Slight impact on processes | Medium: Processes continue but in a modified way | High: Processes temporarily cease | Very High: Permanent cessation of processes |
| **Impact Extent (E)** The geographical extent of the impact on a given environmental receptor | Site: Site only | Local: Inside activity area | Regional: Outside activity area | National: National scope or level | International: Across borders or boundaries |
| **Impact Reversibility (R)** The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change | Reversible: Recovery without rehabilitation | | Recoverable: Recovery with rehabilitation | | Irreversible: Not possible despite action |
| **Impact Duration (D)** The length of permanence of the impact on the environmental receptor | Immediate: On impact | Short term: 0-5 years | Medium term: 5-15 years | Long term: Project life | Permanent: Indefinite |
| **Probability of Occurrence (P)** The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation | Improbable | Low Probability | Probable | Highly Probability | Definite |
| **Significance (S)** is determined by combining the above criteria in the following formula: | $[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$ | | | | |
| **IMPACT SIGNIFICANCE RATING** | | | | | |
| **Total Score** | **4 to 15** | **16 to 30** | **31 to 60** | **61 to 80** | **81 to 100** |
| **Environmental Significance Rating (Negative (-))** | **Very low** | **Low** | **Moderate** | **High** | **Very High** |
| **Environmental Significance Rating (Positive (+))** | **Very low** | **Low** | **Moderate** | **High** | **Very High** |

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 3.2 below.

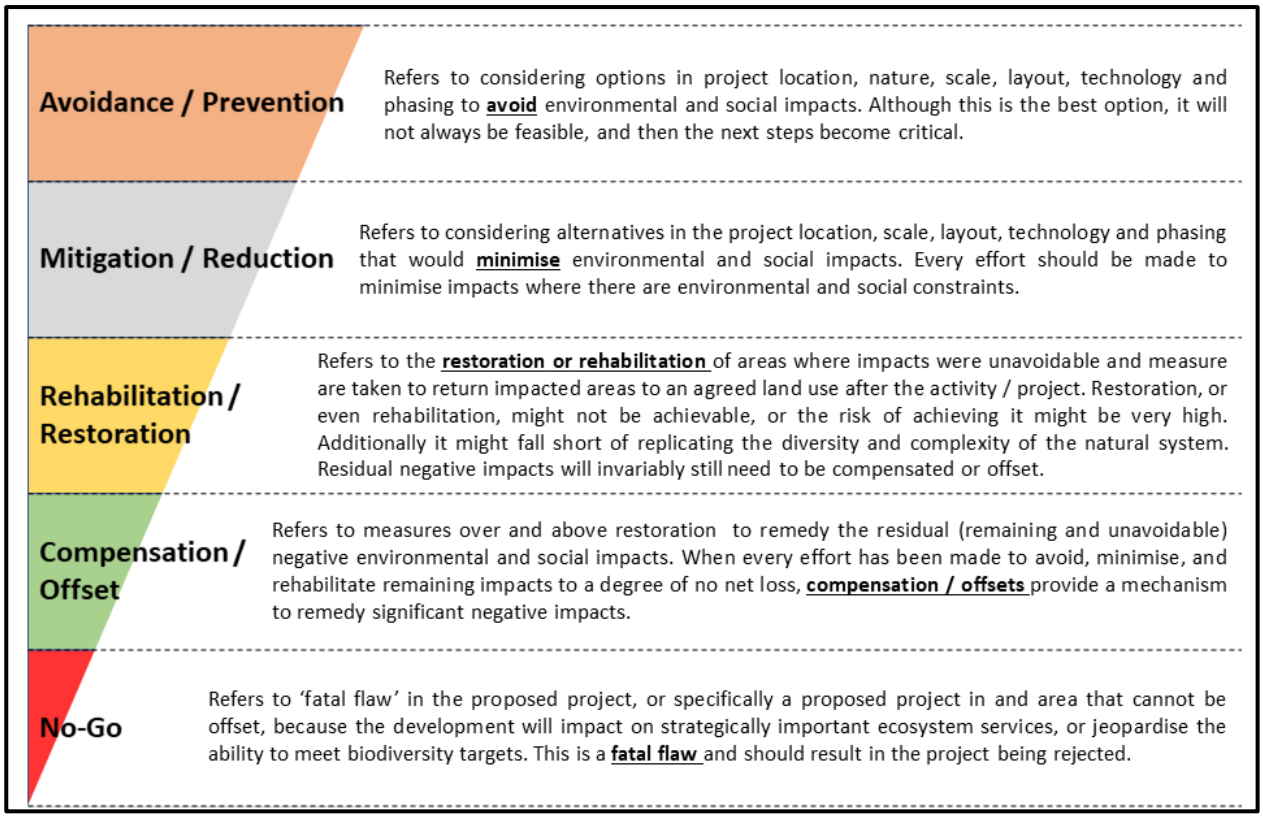


Figure 4.2. Mitigation Sequence/Hierarchy

### 4.7 Assumptions and limitations of the study

- The authors acknowledge that the brief literature review is not exhaustive of the literature of the area.
- Due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded, and the possible occurrence of graves and other cultural material cannot be excluded. This limitation is successfully mitigated with the implementation of a Chance Find Procedure (CFP) and monitoring of the study area by the Environmental Control Officer (ECO).
- This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys.
- According to the NHRA public participation should be conducted for the Project and it is assumed that the social/environmental team included this in the process run by EAP with inputs from the heritage consultant. Additional social consultation in terms of graves (relocation process) will be handled as a next phase of study if required.
- Field data was recorded by handheld GPS and Mobile GPS applications. It must be noted that during the process of converting spatial data to final drawings and maps the accuracy of spatial data may be compromised. Printing or other forms of reproduction might also distort the spatial distribution in maps. Due care has been taken to preserve accuracy
- This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components will be highlighted through the public consultation process if relevant. This process is facilitated by the EAP and if not done this can be considered a significant limitation and as a potential Project risk. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.

## 5 Description of Socio-Economic Environment

According to Census 2011, Msukaligwa Local Municipality has a total population of 149 377 people, of which 88,1% are black African, 9,8% are white, 1,1% are Indian/Asian, and 0,6% are coloured. The other population groups make up the remaining 0,3%. Of those aged 20 years and older, 4,5% have completed primary school, 32,7% have some secondary education, 29,3% have completed matric, 9,6% have some form of higher education, and 12,3% have no form of schooling. According to Census 2011, 41 698 are employed whereas 5 311 are discouraged work-seekers. The unemployment rate is 26,8%. There are 15 267 unemployed people. Of the youth aged 15–34, 20 261 are employed while 10 679 are unemployed. The unemployment rate for the youth is 34,5% (statssa.gov.za).

## 6 Results of Public Consultation and Stakeholder Engagement:

In line with the NHRA, stakeholder engagement is a key component of any EA process, it involves stakeholders interested in or affected by the proposed development. At the time of writing no heritage concerns have been raised.

# 7 Contextualising the study area

## 7.1 Archaeological Background

### 7.1.1 Stone Age

The Stone Age of southern Africa starts when hominins (ancestral to modern-day humans) first started to produce crude tools made with stone. The Earlier Stone Age (ESA 2 million – 200 000 years ago) is associated with hominins such as *Homo habilis* and *Homo erectus* (Dusseldorp *et al*. 2013). Mpumalanga currently does not have an extensive ESA archaeological record, at Maleoskop on the farm Rietkloof, only a few ESA artefacts have been found, and stone tools consisted of choppers (Oldowan), hand axes, and cleavers (Acheulean) (Esterhuysen & Smith 2007) and some surface scatters have been recorded near Piet Retief (Nel & Karodia 2013).

Middle Stone Age (MSA) artefacts represent archaic and modern humans that occupied the landscape between 300 000 to 40 000 years before present. Later Stone Age (LSA) occupational sequences reflect San and Khoisan communities from 40 000 years ago until recently (Dusseldorp *et al.* 2013). Although the MSA and LSA has not been extensively studied in Mpumalanga, evidence for these periods has been excavated from Bushman Rock Shelter in the Ohrigstad District (Esterhuysen & Smith 2007; Lombard *et al*. 2012) and it is known that San communities lived near Lake Chrissie as recently as the 1950s (e.g., Schlebusch *et al*. 2016). MSA and LSA surface scatters have also been investigated in the vicinity of Piet Retief, and De Wittekrans nearby Camden is a Later Stone Age archaeological rock art site complex (Nel & Karodia 2013).

### 7.1.2 Iron Age

The archaeology of farming communities of southern Africa encompasses three phases. The Early Iron Age (200-900 CE) represents the arrival of Bantu-speaking farmers in southern Africa. Living in sedentary settlements often located next to rivers, these farmers cultivated sorghum, beans, cowpeas, and kept livestock. The Middle Iron Age (900-1300 CE) is mostly confined to the Limpopo Valley in southern Africa with Mapungubwe Hill probably representing the earliest ‘state’ in this region (Huffman 2007).

The Late Iron Age (LSA - 1300-1840s CE) marks the arrival and spread of ancestral Eastern Bantu-speaking Nguni and Sotho-Tswana communities into southern Africa. The location of Late Iron Age settlements is usually on or near hilltops for defensive purposes. The Late Iron Age as an archaeological period ended by 1840 CE, when the Mfecane caused major socio-political disruptions in southern Africa (Huffman 2007). Close to Ermelo, on Tafelkop Mountain, is the well-known LIA Tafelkop Settlement. It consists of various settlement complexes with over 100 corbelled huts in numerous clusters on the mountain top (Esterhuysen & Smith 2007). The site was declared a Provincial Heritage Site.

Dates from Early Iron Age sites indicated that by the beginning of the 5th century CE Bantu-speaking farmers had settled in the Mpumalanga lowveld. Subsequently, farmers continued to move into and between the lowveld and highveld of Mpumalanga. Iron Age sites such as Welgelegen Shelter, Robertsdrift situated 50-100 km west of Camden dates from the 12th to the 18th century (Derricourt & Evers 1973; Esterhuysen & Smith 2007).

During the mid-17th century Europeans started to settle in modern-day Cape Town. During and after the conflict caused by the Mfecane (1820-1840), during the reign of king kaSenzangakhona Zulu, known as Shaka, Dutch-speaking farmers started to migrate to the interior regions of South Africa. A period that is marked by various skirmishes and battles between the local inhabitants, Dutch settlers and the British (Giliomee & Mbenga 2007).

### 7.1.3 Historical Background

Camden power station was commissioned in 1967 (Gaigher 2011; Matenga 2020). However, the nearby town of Ermelo has a rich history. The earliest record for settlers in Ermelo is from 1860, when the area was under the jurisdiction of Zulu-speaking Nhlapo communities (Nhlapo 1945). The construction of the town of Ermelo was initiated by the Dutch Reformed Church, which purchased the eastern part of the farm Nooitgedacht on 26 May 1879. The town was officially proclaimed on 12 February 1880 by William Owen Lanyon, the Administrator of the Transvaal (Greyling 2017).

### 7.1.4 Battlefield and War History

Due to the proximity of Ermelo to the Nederlandsche Zuid-Afrikaansche Spoorweg-Maatskappij railway line linking Pretoria with Lourenço Marques (Maputo), the area was subject to various skirmishes during the Anglo-Boer War of 1899-1902. At the time there were about 100 families residing in the town and many women and children were sent to British concentration camps. In 1901, British troops burnt the town down due to their scorched earth policy, and Ermelo was rebuilt in 1903 (Moody 1977; Pretorius 2000; Van Schalkwyk 2012; Greyling 2017).

### 7.2 Literature Review (SAHRIS)

Several Cultural Resource Management (CRM) surveys are on record for the general area and the relevant results of these studies are briefly discussed below and outlined in Table 6.

**Table 6. Studies consulted for the project.**

| Author | Year | Project | Findings |
|---|---|---|---|
| Van Schalkwyk, L. | 2006 | Heritage Impact Assessment for the Majuba-Umfolozi 765 KV Transmission Line in Mpumalanga and KwaZulu-Natal, South Africa, Pietermartizburg: eThembeni Cultural Heritage | Ancestral graves: Rock painting sites that were recorded along and below the eastern uKhahlamba escarpment; Stone Age open air sites; Stone walled settlements dating to the Late Iron Age; Battlefields of:<br>- Majuba (1887);<br>- Hlobane (1879);<br>- Holkrantz (1879);<br>- Khambula (1879 |
| Fourie, W. | 2008 | Camden Power Station Rail expansion project on portions of the farm Mooiplaats 290 IT and the farm Camden Power Station 329 IT, District Ermelo, Mpumalanga | The remains of a stone ruin were identified at this location. The structure consists of two rooms. Only the foundations and rubble remain of the structure. Recent historic |
| Gaigher, S. | 2011 | First Phase Heritage Impact Assessment for the Proposed Extension to the Camden Ash Disposal Facilities | Small graveyard (5 graves), historic farmland reservoirs, furrows, pathways. |
| Pistorius, J.C.C. | 2011 | Kusipongo Expansion Project: A Heritage Baseline Study for Proposed Adit Positions in a Project Area near the Heyshope Dam to the West of Piet Retief in the Mpumalanga Province of South Africa, KwaZulu-Natal: Environmental Resources Management (South Africa) Pty Ltd (ERM) | A single, historic informal grave with stone dressing. A single square cattle enclosure. Late Iron Age site with stone wall enclosures. historical graveyard demarcated with stone walling. A sandstone bank that may be associated with Stone Age sites. |
| Van Schalkwyk, J. | 2012 | Basic assessment and environmental management programme: Construction of a 132kV transmission Line from the Kliphoek to Panbult Substation and Kliphoek to Uitkoms Substation: Mpumalanga Province | Some farmsteads and other farming related features. Several formal and informal cemeteries |
| Nel, J. & Karodia, S. | 2013 | Heritage Impact Assessment Report Kangra Coal | Historical structures and associated trees, cemeteries, sandstone outcrop with potential for Rock Art |
| Van der Walt, J. | 2015 | Camden Ash Disposal – Grave confirmation study | Four cemeteries and two historical structures as well as stone cairns. |
| Gaigher, S. | 2015 | Report on the Social Consultation Regarding the Relocation of Graves within the Proposed Development Area for the Camden Ash Disposal Facilities | Burial sites (19 graves, 7 graves 2 graves and 5 graves respectively). |
| Van Schalkwyk, J. | 2016 | Cultural Heritage Impact assessment for the planned borrow pits and quarries for the improvement of the national route N2, km 60 (Leiden) to km 87.4 (Camden), Gert Sibande District Municipality, Mpumalanga Province | Historic informal cemetery with more than 35 graves.<br>Three old railway culverts that formed part of the original railroad alignment which was constructed in 1911.<br>An old sheep dip constructed from concrete. |
| Matenga, E. | 2020 | Heritage Impact Assessment for the proposed improvements to the existing waste reticulation system at Camden power station in Ermelo, Mpumalanga Province | No sites were identified. |
| Van der Walt, J. | 2022a | Heritage Impact Assessment for the proposed Camden I Wind Grid Connection, Mpumalanga Province | Burial sites and structural remains |
| Van der Walt, J. | 2022b | Heritage Impact Assessment for the Proposed Camden I Solar Energy Facility (100MW), Mpumalanga Province, South Africa | Burial sites and structural remains |

| Author | Year | Project | Findings |
|---|---|---|---|
| Van der Walt, J. | 2022c | Heritage Impact Assessment for the Proposed Camden I Wind Energy Facility (up to 210MW), Mpumalanga Province, South Africa | Burial sites and structural remains |
| Van der Walt, J. | 2022d | Heritage Impact Assessment for the Proposed Camden II Wind Energy Facility (up to 210MW), Mpumalanga Province, South Africa. | Burial sites and structural remains |
| Van der Walt, J. | 2022e | Heritage Impact Assessment for the proposed Camden powerline and collector substation, Mpumalanga Province | Burial sites and structural remains |
| Van der Walt, J. | 2022f | Heritage Impact Assessment for the Hendrina South Wind Energy Facility | Burial sites and structural remains |
| Van der Walt, J. | 2022g | Heritage Impact Assessment for the Hendrina North Wind Energy Facility | Burial sites and structural remains |
| Van der Walt, J. | 2022h | Heritage Impact Assessment for the Hendrina South Grid Infrastructure | Burial sites and structural remains |

### 7.3 Google Earth and the Genealogical Society of South Africa (Graves and Burial Sites)

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where archaeological and historical sites might be located. Although numerous burial sites are indicated by the Genealogical Society of the South Africa (GSSA) for the Phefumula Emoyeni One WEF study area, none of these burial sites are situated within the grid infrastructure study area of influence.

## 8 Heritage Baseline

### 8.1 Description of the Physical Environment

The vegetation of the Project area belongs to the Eastern Highveld Grassland and Soweto Highveld Grassland of the Grassland Biome. The Eastern Highveld Grassland is described as Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Rhus magalismontanum*). The Soweto Highveld Grassland 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 (Mucina and Rutherford 2006).

The proposed project area is situated in the large triangular open landscape between Hendrina, Ermelo and Bethal surrounding the small town of Davel in Mpumalanga. The proposed project landscape is dominated by large open fields of grass and small thickets of shrubs and trees scattered throughout. Large sections of the proposed project landscape also consist of agricultural activities. These mainly include cultivated crops and cattle farming. The cultivated crops consist of large, ploughed fields as well as circular crops under pivot irrigation. The landscape is divided mainly into large farms with scattered farmsteads throughout. Informal settlements and labour housing is also scattered throughout the landscape creating a high probability of graves near these areas.

The landscape is largely flat with some low hills visible throughout. Some of the hills within the proposed project landscape have rocky sandstone outcrops. A high number of small streams and drainage lines run throughout the landscape. General site conditions are indicated in (Figure 7.1 to 7.4).

Figure 8.1. General site conditions showing a generally flat terrain.

Figure 8.2. General view of the landscape.

Figure 8.3. Existing powerlines within the Project area.

Figure 8.4. Existing powerlines within the Project area.

## 8.2 Heritage Resources

Heritage observations within the study area included multiple burial sites, farmsteads, ruins, and circular stone enclosures and were recorded as waypoints. General site distribution of the recorded observations in relation to the Project layout is spatially illustrated in Figure 7.5 and briefly described in Table 7. Selected features are illustrated in Figure 7.6 to 7.67.

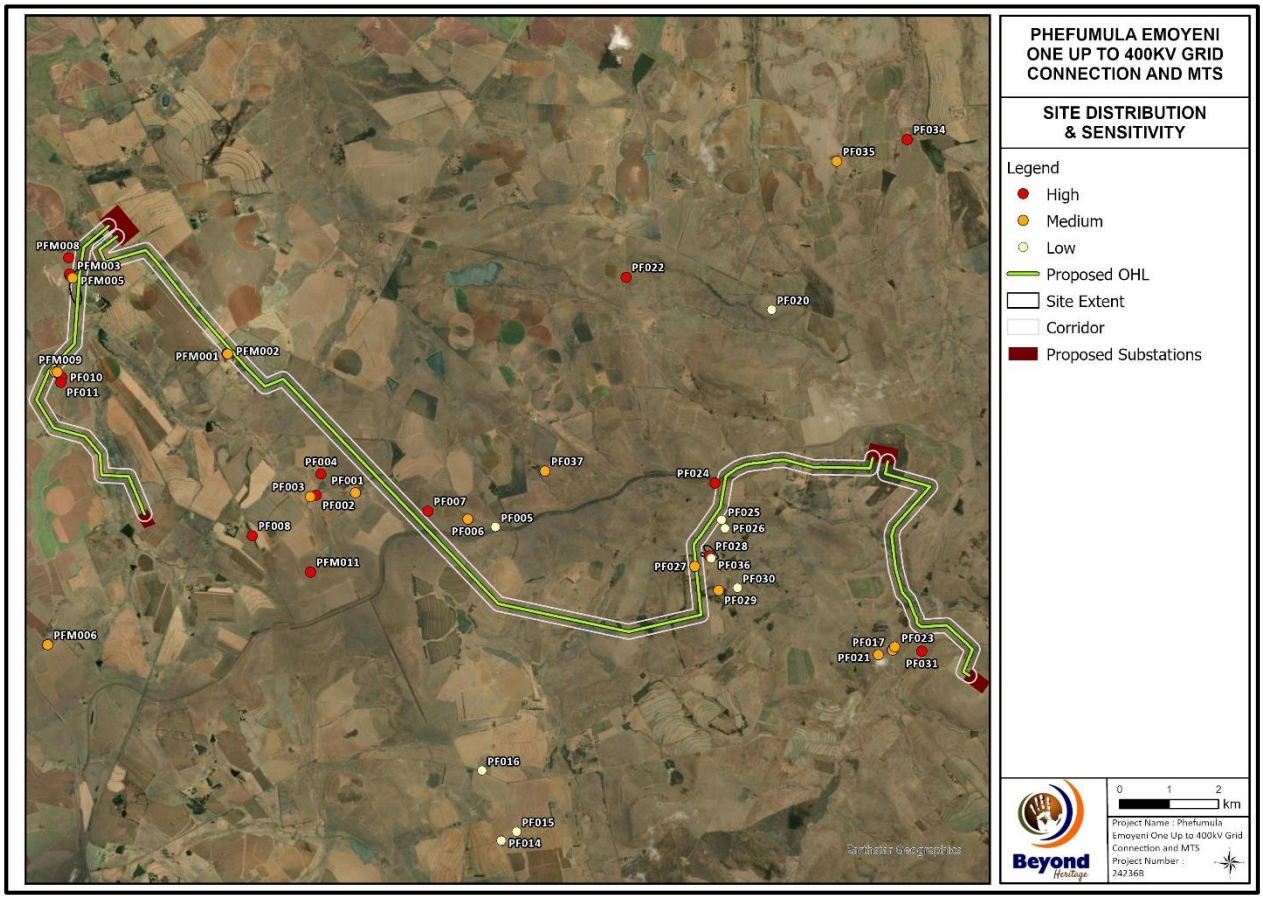



Figure 8.5. Site distribution map.

**Table 7. Sites recorded in the study area.**

| Label | Longitude | Latitude | Description | Significance |
|---|---|---|---|---|
| **PF001** | 29°43'30.73"E | 26°21'46.70"S | Historical farmstead, including multiple structures such as the main historical farmhouse, large barn structure, degraded labour housing and large stone-built kraal. The main farmhouse has been renovated – Still occupied. | Medium Significance GP B |
| **PF005** | 29°45'14.07"E | 26°22'5.62"S | Ruins/ stone packed foundations related to possible historical railroad. The stone packed ruins are situated next to the remnants of an old railway. The foundation is a 5 x 6-meter square foundation. | Low Significance GP C |
| **PF017** | 29°50'7.41"E | 26°23'15.59"S | Two stone packed graves situated within a 10-meter circular stone packed enclosure. The site forms part of the larger ruins of PF018 | High Significance 3A |
| **PF018** | 29°50'7.75"E | 26°23'15.77"S | Stone packed ruins with circular stone packed enclosures situated across a 30 x 20meter area on a large open field of overgrown grasses. The stone packed features are degraded and partially buried. | Medium Significance GP B |
| **PF021** | 29°49'57.57"E | 26°23'19.22"S | Ruins – Remnants of a circular stone packed enclosure of which only sections of the stone packed foundations are still visible. The main enclosure has a diameter of about 15 meters. The site is degraded and partially degraded. | Medium Significance GP B |

| Label | Longitude | Latitude | Description | Significance |
|---|---|---|---|---|
| PF023 | 29°50'9.33"E | 26°23'13.73"S | Stone packed ruins/Circular stone packed walling and enclosures covering a 30 x 15meter area. The circular stone packed features are degraded and partially buried. | Medium Significance GP B |
| PF024 | 29°47'53.13"E | 26°21'31.13"S | Burial site – Large cemetery situated next to a possible historical railway line. Contains 75+ graves made from various materials such as stone packed, granite and brick. | High Significance 3A |
| PF025 | 29°47'58.84"E | 26°21'54.99"S | Ruins/Broken down structure originally built from brick and cement. The site has been demolished with only building rubble still present. The site covers an area of about 90 x 50meter. | Low Significance GP C |
| PF026 | 29°48'1.64"E | 26°22'0.51"S | Degraded school building/ recent. The structure seems to have been part of a small school. The structure is built from brick and cement with the original zinc roof. | Low Significance GP C |
| PF027 | 29°47'40.90"E | 26°22'26.23"S | Large historical farmstead containing multiple historical structures that are still being used to some extent on the farm.– Currently occupied. | Medium Significance GP B |
| PF028 | 29°47'51.12"E | 26°22'18.92"S | Burial site containing two stone packed graves and metal grave markers situated near a large area containing the ruins of an informal settlement at PF036 | High Significance 3A |
| PF029 | 29°47'58.85"E | 26°22'41.36"S | Historical farmstead including an intact but unoccupied historical farmhouse as well as stone-built ruins situated just west of the farmhouse on the other side of the small gravel road. The farmhouse is intact but degraded. | Medium Significance GP B |
| PF030 | 29°48'12.50"E | 26°22'39.17"S | Large historical stone packed kraal situated 400meters east of PF029 near a small drainage line. The large, stone packed kraal has become overgrown and degraded. 25x15m | Low Significance GP C |
| PF031 | 29°50'29.24"E | 26°23'15.85"S | Burial site containing 20-25 graves made from various materials such as granite, cement and brick and stone packed grave dressings. | High Significance 3A |
| PF036 | 29°47'52.40"E | 26°22'20.52"S | Large broken down and degraded informal settlement. The entire settlement has been demolished to the point that only building rubble and mounded foundations are still visible. | Low Significance GP C |
| PFM001 | 29°43'30.73"E | 26°21'46.70"S | Small fenced off burial site containing 3 graves of the Durr family. The original grave dates to 1935 while the two other graves date to 2010 and 2011. | High Significance 3A |
| PFM002 | 29°41'53.31"E | 26°20'19.15"S | Large Historical farmstead with various structures. The burial site PFM001 is likely associated with the farmstead. | Medium Significance GP B |
| PFM003 | 29°42'57.77"E | 26°21'50.46"S | Small burial site containing one grave which has been fenced off using logs and wire. | High Significance 3A |
| PFM004 | 29°39'55.61"E | 26°19'31.87"S | Large fenced off burial site consisting of 60 -70 graves. Many of the graves are stone packed graves, with some formal granite graves. Many graves have also overgrown and are mounded graves. | High Significance 3A |
| PFM005 | 29°39'57.81"E | 26°19'33.50"S | Large broken down informal settlement near the river. The site is likely associated with the large burial site PFM004. | Medium Significance GP B |
| PFM006 | 29°39'50.10"E | 26°23'34.28"S | The site consists of stone masoned historical structures. One of the structures is partially demolished. | Medium Significance GP B |
| PFM008 | E29° 39' 54.4" | S26° 19' 20.3" | Cemetery with 25 graves. 17 stone packed graves, 2 brick packed graves and 6 marble graves with engraved headstones. | High Significance 3A |
| PFM009 | E29° 39' 47.5" | S26° 20' 35.4" | PFM008 is an old windmill and PFM009 is a 10x20m sandstone foundation that is overgrown and only partially visible. The presence of the windmill, the stone foundation and the fact that there are rose bushes nearby indicate that this used to be a farmstead. There is a planned overhead powerline that will be over it which will require monitoring due to possible associated graves. | Low Significance GP C |
| PFM010 | E29° 39' 49.2" | S26° 20' 35.4" | | High Significance 3A |
| PFM011 | 29°39'49.21"E | 26°20'35.40"S | Possible grave. This site has some stone laid in a row as well as a large stone that is erected on its side which could serve | High Significance 3A |

| Label | Longitude | Latitude | Description | Significance |
|---|---|---|---|---|
| | | | the purpose of a headstone. The site has unfortunately been eroded by water. | |

Figure 8.6. General view of the farmstead at PF001.

Figure 8.7. Occupied building at the farmstead PF001.

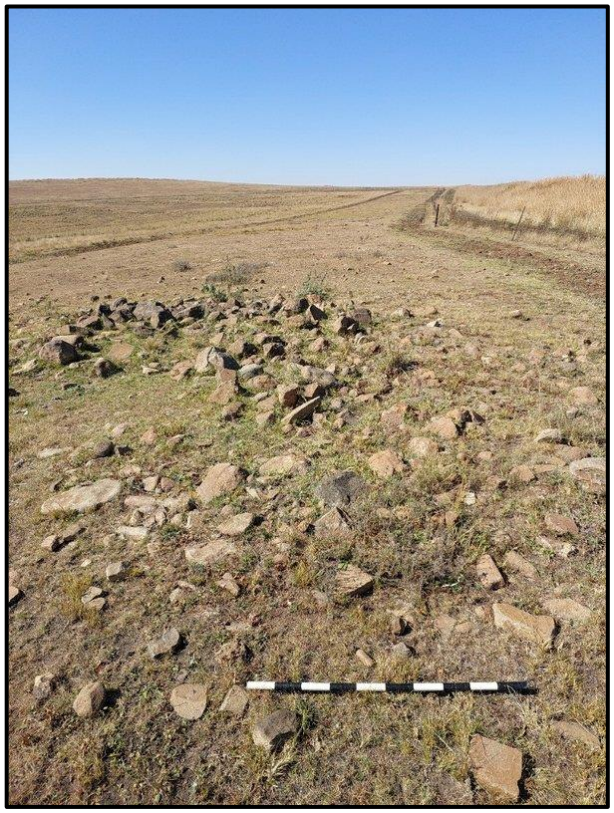


Figure 8.8. Ruins at PF005.

Figure 8.9. Site overview of burial site PF017.

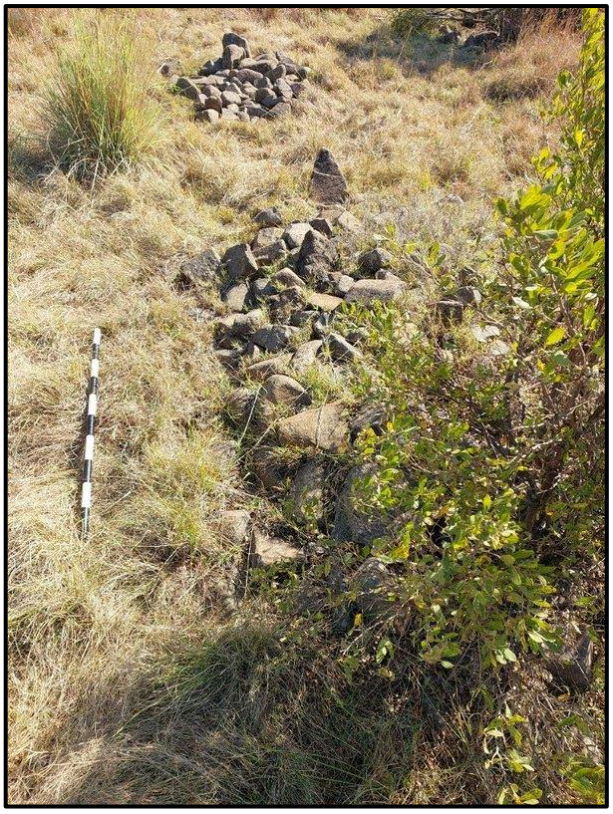


Figure 8.10. Stone packed grave at PF017.

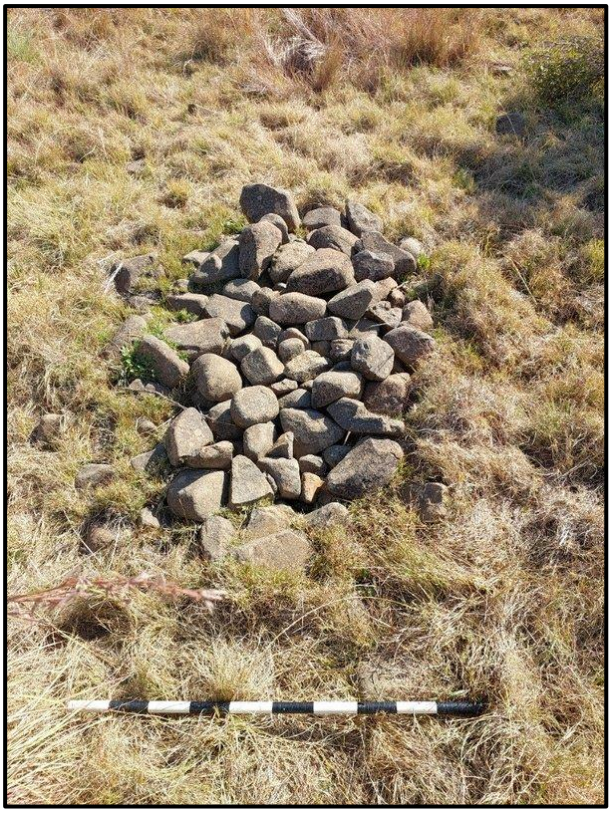


Figure 8.11. Stone packed grave at PF017.

Figure 8.12. Site overview of stone ruins at PF018.

Figure 8.13. Section of stone packed enclosure at PF018.

Figure 8.14. General site overview of stone packed ruins at PF021.

Figure 8.15. Stone packed ruins at PF021.

Figure 8.16. Overview of stone packed ruins at PF023.

Figure 8.17. Section of stone packed wall at PF023.

Figure 8.18. Overview of burial site PF024.

Figure 8.19. Stone packed grave at PF024.


Figure 8.20. Granite grave of Johannes Sibiya at PF024 (2014).


Figure 8.21. Granite grave of Dingaan David Sibiya at PF024 (2011).

Figure 8.22. Granite and stone grave at PF024.

Figure 8.23. Overgrown stone packed grave at PF024.

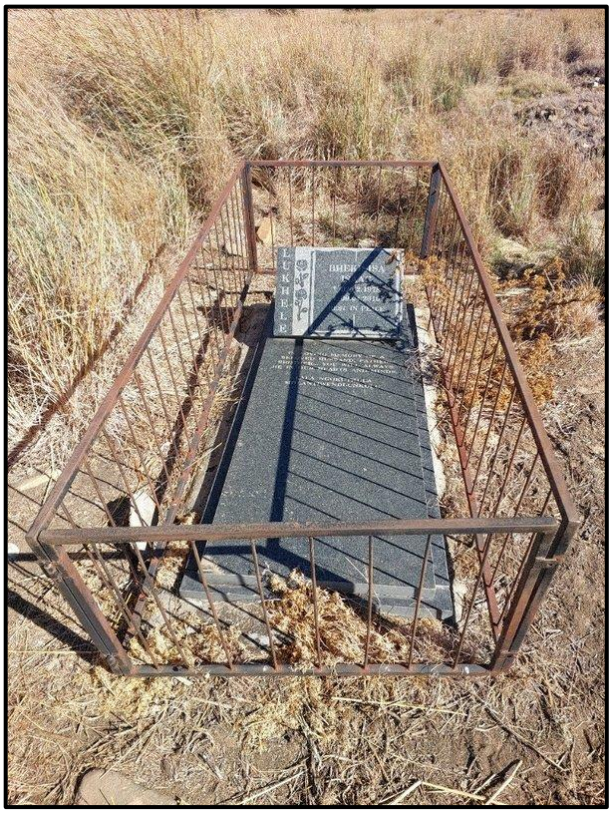


Figure 8.24. Fenced off granite grave at PF024.


Figure 8.25. Fenced off granite grave at PF024 (2022).


Figure 8.26. Overgrown and degraded grave at PF024 (1998).

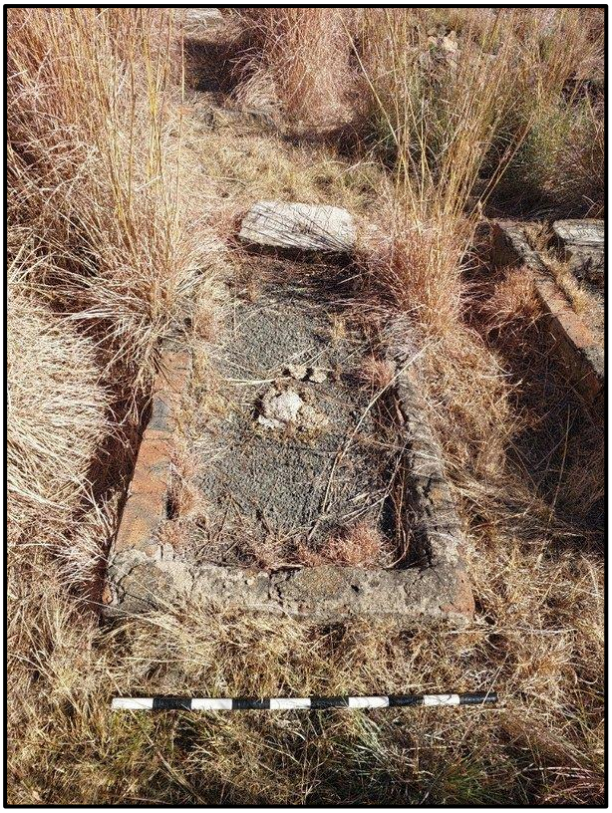


Figure 8.27. Brick built grave at PF024.


Figure 8.28. Overgrown granite and cement grave of Khehla Bhunti Sibiya at PF024.

Figure 8.29. View of broken-down structure at PF025.

Figure 8.30. Broken down structure at PF025.

Figure 8.31. Degraded school building at PF026.

Figure 8.32. View of various structures at the farmstead PF027.

Figure 8.33. View of occupied farmstead at PF027.

Figure 8.34. View of the two graves at burial site PF028.

Figure 8.35. Stone packed grave with headstone at PF028.

Figure 8.36. Stone packed grave of Khokho Mnguni with headstone at PF028.

Figure 8.37. View of intact farmhouse at PF029.

Figure 8.38. Alternative view of the farmhouse at PF029.

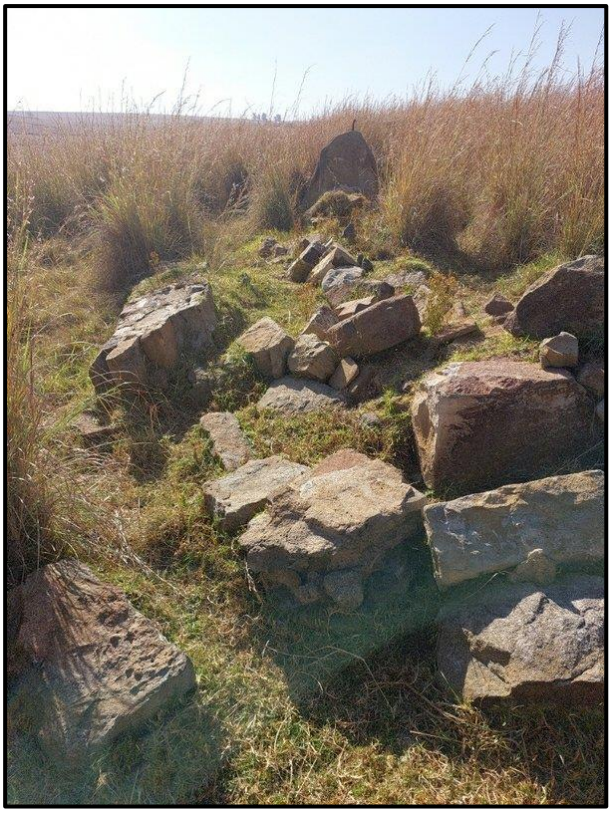


Figure 8.39. Stone packed kraal at PF030.

Figure 8.40. Stone packed kraal at PF030.

Figure 8.41. View of fenced off burial site PF031.


Figure 8.42. Granite grave of Tshepo Masilela at PF031.


Figure 8.43. Overgrown stone packed grave at PF031.

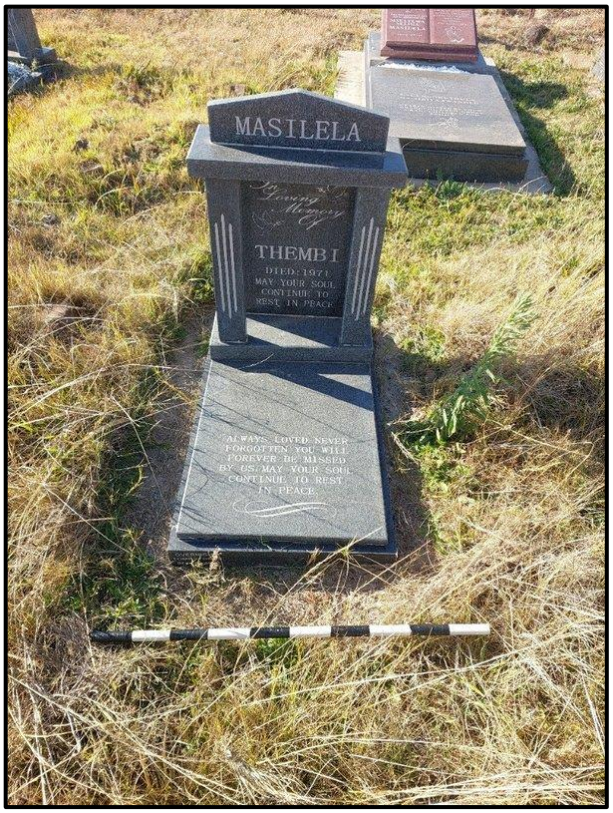



Figure 8.44. Granite grave of Tembi Masilela at PF031 (1971).

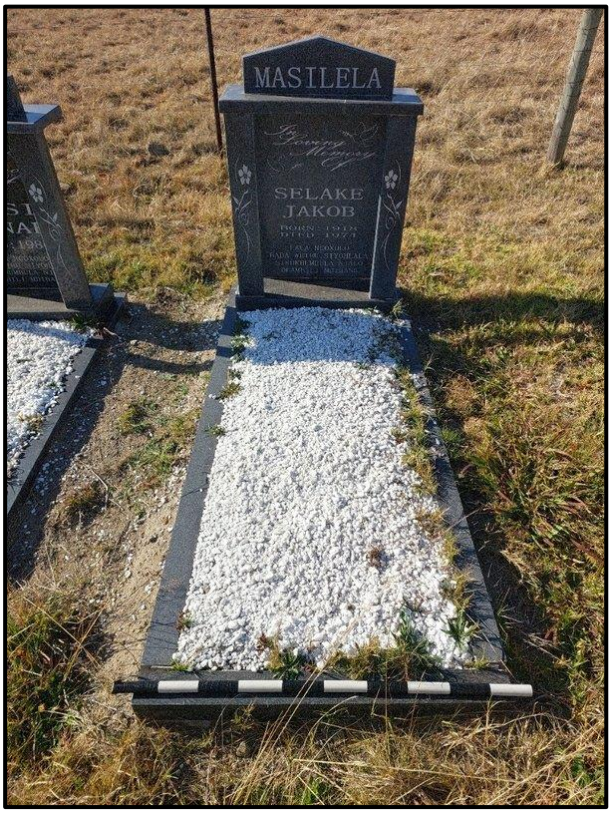



Figure 8.45. Granite grave of Selake Jakob Masilela at PF031 (1974).

Figure 8.46. Granite grave at PF031 (1980).


Figure 8.47. Packed grave at PF031.

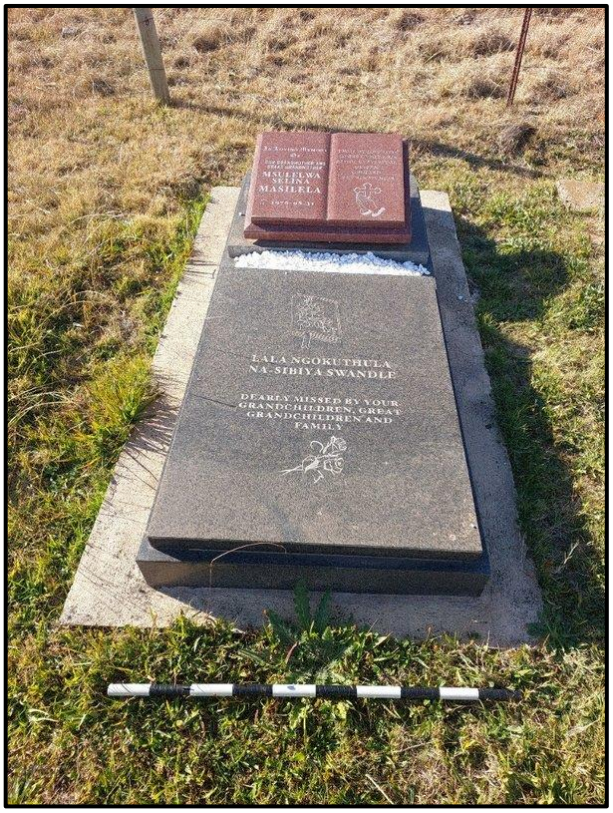


Figure 8.48. Granite grave at PF031 (1976).

Figure 8.49. Granite grave at PF031 (1961).

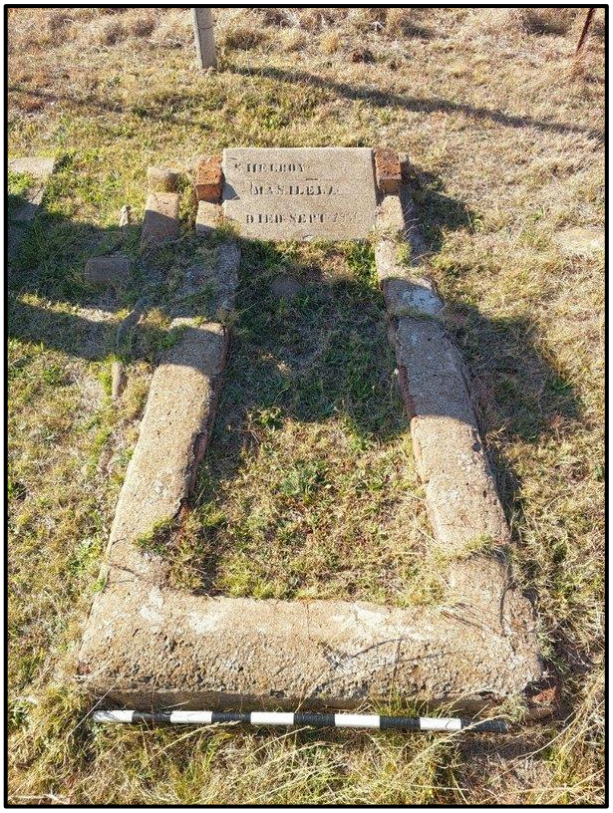


Figure 8.50. Cement and brick grave at PF031 (1950).


Figure 8.51. Granite grave of Mashila Piet Masilela at PF031 (1997).

Figure 8.52. Brick built grave at PF031.

Figure 8.53. Broken down structure at PF036.

Figure 8.54. View of fenced off burial site PFM001.

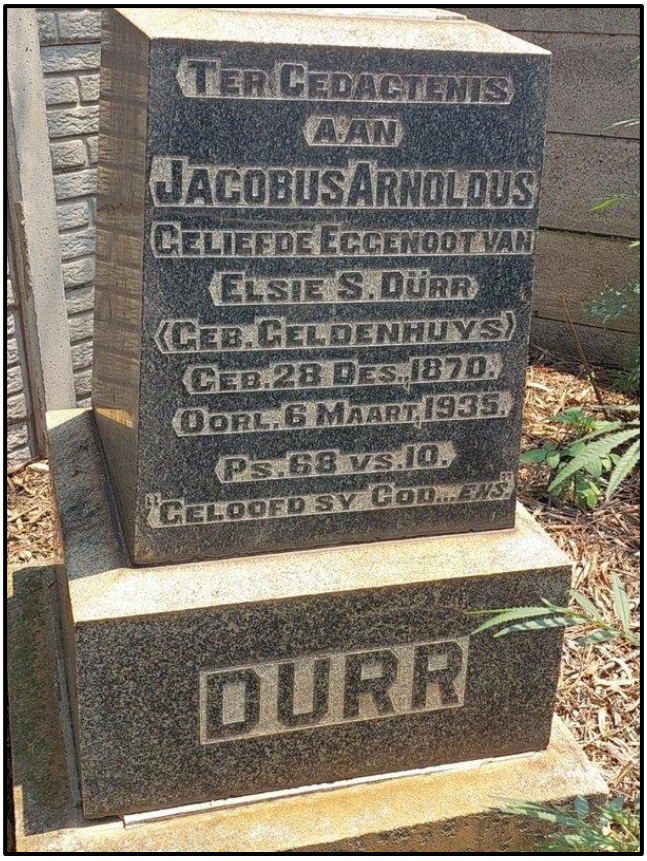



Figure 8.55. Historical grave at PFM001 (1935).

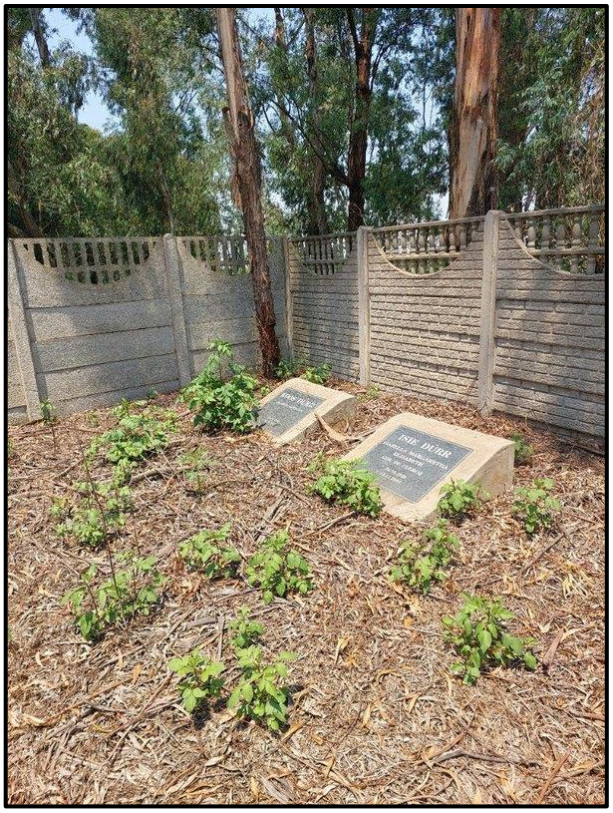


Figure 8.56. Two modern graves at PFM001 (2010 and 2011).

Figure 8.57. General view of farmstead PFM002.

Figure 8.58. View of large structure within the farmstead PFM002.

Figure 8.59. View of the single grave at PFM003.

Figure 8.60. View of various stone packed graves in burial site PFM004.

Figure 8.61. View of various mounded graves in burial site PFM004.

Figure 8.62. Stone packed graves in burial site PFM004.

Figure 8.63. Cement grave with granite dressing (1984).

Figure 8.64. Mounded remains of settlement at PFM005.

Figure 8.65. Ruins at PFM005.

Figure 8.66. General view of historical structures PFM006.

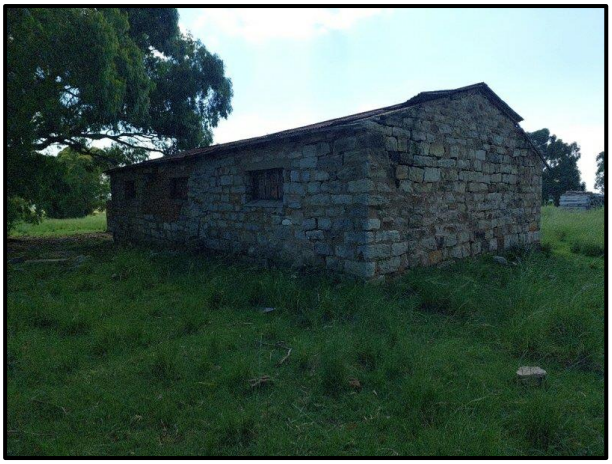


Figure 8.67. Stone masoned structure at PFM006.

### 8.3 Cultural Landscape

The surrounding area and most of the impact area are cultivated, and forms part of a landscape characterised by wide scale cultivation and mining activities. Development in the study area is limited to farming infrastructure such as access roads, fences, and agricultural developments. The clusters of trees around farmsteads are generally planted to protect the houses from wind and they form part of the cultural landscape. Within the OHL corridors, the farmsteads PF002, PF005, PFM009, PF010 are illustrated on topographic maps from 1963 and 1964 and as they are older than 60 years, these structures and remains are protected by thew NHRA.


Figure 8.68. Extract of the 1963 Topographic map (1: 50 000) indicating structures around the area of PFM001, PFM0002.

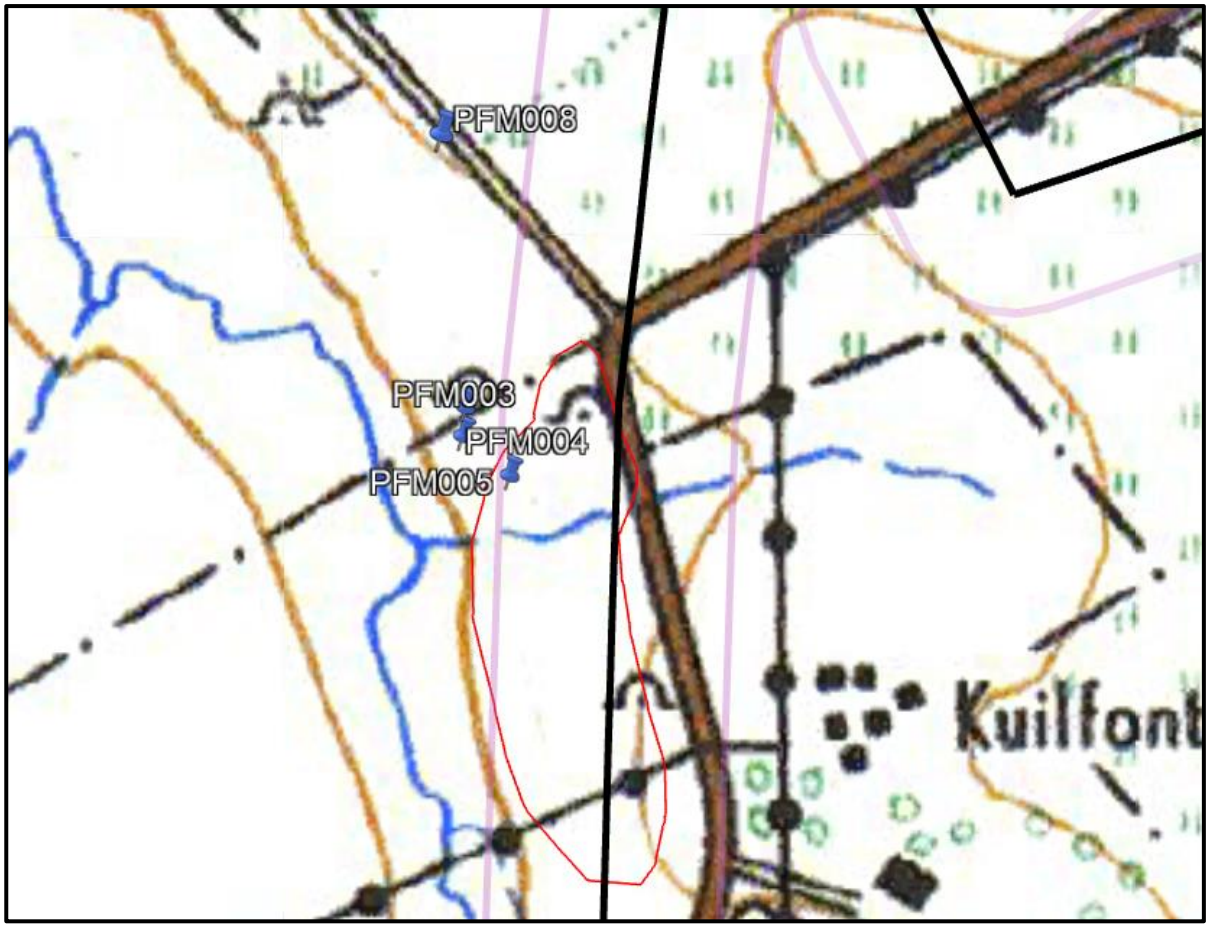



Figure 8.69. Extract of the 1963 Topographic map (1: 50 000) indicating huts around the general area of PFM003, PFM004, PFM005.


Figure 8.70**.** Extract of the 1963 Topographic map (1: 50 000) indicating huts around the general area of PFM003, PFM004, PFM005.

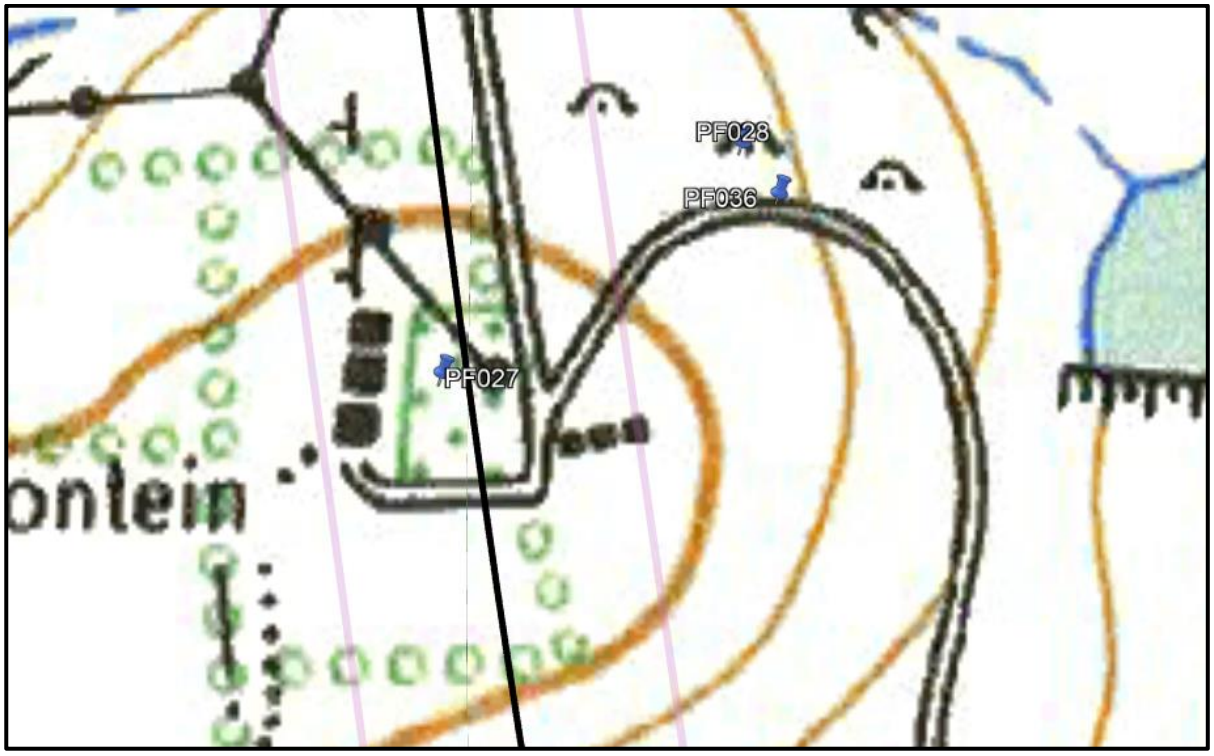
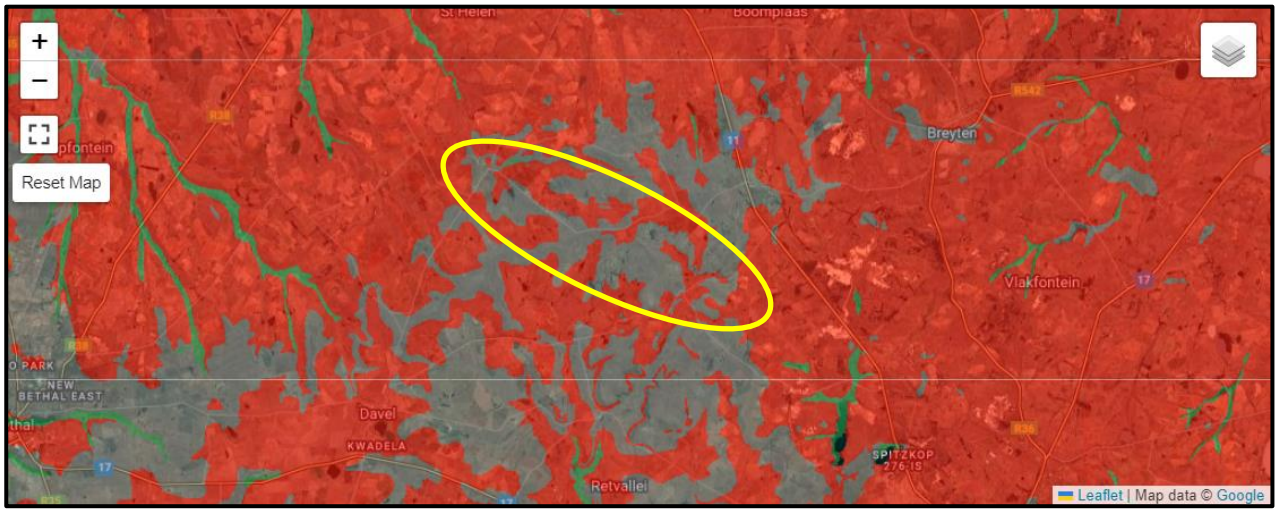



Figure 8.71. Extract of the 196 Topographic map (1: 50 000) indicating structures within the farmstead PF027.

### 8.4 Paleontological Heritage

According to the SAHRA palaeontological sensitivity map, the study area is indicated as insignificant and very high palaeontological sensitivity (Figure 7.72), and an independent study was commissioned for this aspect (Bamford 2024). Bamford (2024) concluded that the proposed route and site lie on the potentially very highly sensitive Vryheid Formation (Ecca Group, Karoo Supergroup) that might preserve fossil plants of the *Glossopteris* flora so a site visit walkdown and verification was carried by palaeontologists. They confirmed that there were no fossils visible on the land surface which is covered by soils and vegetation or has been ploughed for agriculture. Based on the site visit walkdown, experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary. There is a very small chance that fossils may occur in below the soils in the unweathered mudstones, siltstones and shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr.




| 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 8.72. Paleontological sensitivity of the approximate study area (yellow polygon) as indicated on the SAHRA Palaeontological sensitivity map.

# 9 Assessment of impacts

## 9.1 Impacts on tangible heritage resources.

The main cause of impacts to archaeological resources is physical disturbance of the material itself and its context during removal of topsoil and vegetation as well as the excavations associated with the establishment of infrastructure.

**Corridor 1**

The Corridor 1 buffer zone will impact the Historical farmstead at PFM009, PF010 as well as the large informal settlement which appears as huts on historical maps. These sites should preferably be avoided with a 30m buffer zone.

**Corridor 2**

The burial site PMF001 is situated within the buffer zone of the OHL corridor 2 and must be avoided with a 30m buffer zone. Historical farmsteads PMF002 and PMF027 are also situated within OHL Corridor 2 and as they are protected by the NHRA they must be avoided with a 30m buffer zone.

**Corridor 3**

No sites are situated within the OHL Corridor, and it will have no impact to heritage resources.

Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a chance find procedure. Mitigation measures as recommended in this report should be implemented during all phases of the project. Impacts of the project on heritage resources is expected to be low during all phases of the development if mitigation measures are followed.

### 9.1.1 Cumulative impacts

Cumulative impacts within the region are expected to increase with the accumulation of renewable projects within the 55km radius of the Project area (Figure 8.1). Cumulative impacts by the Project can be mitigated to an acceptable level as the heritage resources which can be impacted on the current layout, can be avoided by micro siting of the powerline.

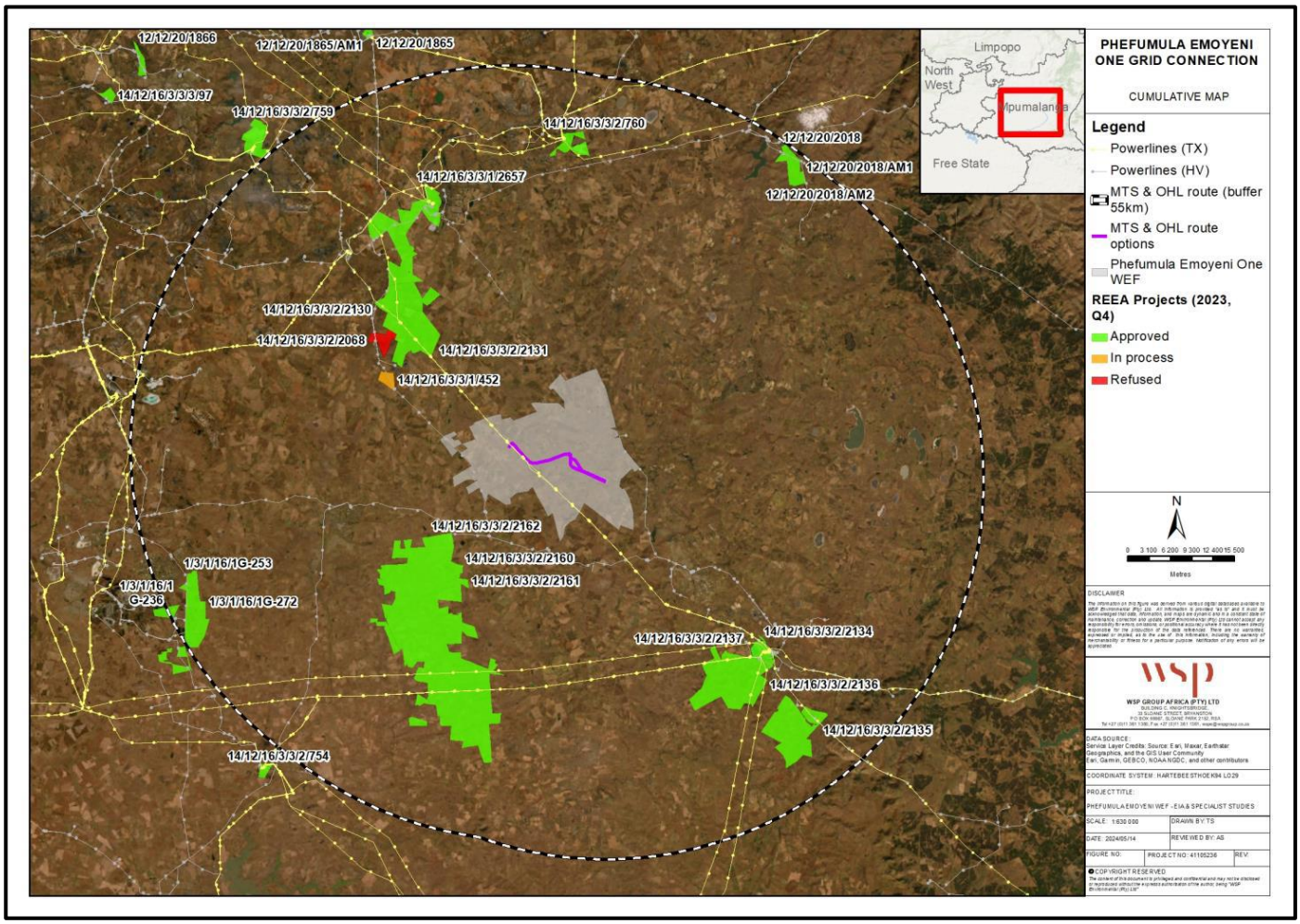



Figure 9.1. Projects within a 55 km radius of the Project area for the Phefumula Emoyeni One Grid Connection.

## 9.2 Impact Assessment Tables

**Table 8. Impact assessment for Construction phase of the Project.**

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | PFM002, PFM005, PFM009, PFM010, PF027 | Loss of heritage resources | Construction | Negative | moderate | 3 | 1 | 5 | 5 | 3 | **42** | **N3** | 3 | 1 | 5 | 5 | 1 | **14** | **N1** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N1 - Very Low** | | | | | | |
| **Impact 2:** | PMF001 | Impact to graves or burial sites | Construction | Negative | moderate | 4 | 2 | 5 | 5 | 3 | **48** | **N3** | 4 | 2 | 5 | 5 | 1 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

**Table 9. Impact assessment for Operational phase of the Project.**

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | PFM002, PFM005, PFM009, PFM010, PF027 | Loss of heritage resources | Construction | Negative | moderate | 3 | 1 | 5 | 5 | 3 | **42** | **N3** | 3 | 1 | 5 | 5 | 1 | **14** | **N1** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N1 - Very Low** | | | | | | |
| **Impact 2:** | PMF001 | Impact to graves or burial sites | Construction | Negative | moderate | 4 | 2 | 5 | 5 | 3 | **48** | **N3** | 4 | 2 | 5 | 5 | 1 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

### Table 10. Impact assessment for Decommissioning phase of the Project.

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | PFM002, PFM005, PFM009, PFM010, PF027 | Loss of heritage resources | Construction | Negative | moderate | 3 | 1 | 5 | 5 | 3 | **42** | **N3** | 3 | 1 | 5 | 5 | 1 | **14** | **N1** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N1 - Very Low** | | | | | | |
| **Impact 2:** | PFM001 | Impact to graves or burial sites | Construction | Negative | moderate | 4 | 2 | 5 | 5 | 3 | **48** | **N3** | 4 | 2 | 5 | 5 | 1 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

### Table 11. Cumulative Impact Assessment for the Project

| Impact number | Receptor | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | | (M+ | E+ | R+ | D)x | P= | S | |
| **Impact 1:** | Impacted sites (PFM001, PFM002, PFM005, PFM009, PFM010, PF027) | Cumulative impacts to heritage resources | Cumulative | Negative | Moderate | 4 | 2 | 5 | 5 | 3 | **48** | **N3** | 4 | 2 | 5 | 5 | 1 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

# 10 Conclusion and recommendations

The Project area is situated within a large, open landscape of which large sections have been used for agricultural activities as well as cattle farming. Many farmsteads are also situated throughout the Project area, with some still being occupied. During the site visit conducted after the Project layout change, burial sites. Historical farmsteads and an Historical settlement with remains were recorded.

Of these newly recorded sites, Historical settlement PFM005 and Historical farmstead PFM009, PFM010 lie within OHL corridor 1. burial site PFM001, Historical farmstead PMF002, lies within the OHL corridor 2. Previously recorded Historical farmstead PF027 also lies within the OHL Corridor 2. These sites will require to be avoided and monitored during construction.

According to the South African Heritage Resource Authority (SAHRA) Paleontological sensitivity map the study area is of insignificant, and very high palaeontological sensitivity. Bamford (2024) concluded that the proposed route and site lie on the potentially very highly sensitive Vryheid Formation (Ecca Group, Karoo Supergroup) that might preserve fossil plants of the *Glossopteris* flora so a site visit walkdown and verification was carried by palaeontologists. They confirmed that there were no fossils visible on the land surface which is covered by soils and vegetation or has been ploughed for agriculture. Based on the site visit walkdown, experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary.
There is a very small chance that fossils may occur in below the soils in the unweathered mudstones, siltstones and shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr.

The impact to heritage resources can be mitigated to an acceptable level provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval.

## 10.1 Recommendations for condition of authorisation

The following recommendations for Environmental Authorisation apply and the Project may only proceed based on approval from SAHRA:

- Burial site PFM001 which lies within OHL Corridor 2 must be avoided with a 30m buffer zone;
- Historical farmsteads and structures PFM002, PFM005, PFM009, PFM010, PF027 must be avoided with a 30m buffer zone;
- All sites of medium and high significance which will not be impacted should be added to development plans and avoided with a 30m buffer zone;
- Development activities must be confined to the approved development footprint only;
- Monitoring of the Project area by the ECO during pre-construction and construction phases for heritage and palaeontology chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9.

## 10.2 Chance Find Procedure

### 10.2.1 Heritage Resources

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below and monitoring guidelines applicable to the Chance Find procedure is discussed below and monitoring guidelines for this procedure are provided in Section 9.5.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this Project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

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

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

## 10.3 Reasoned Opinion

The overall impact of the Project with the recommended mitigation measures is acceptable and residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the Project.

## 10.4 Potential risk

Potential risks to the proposed Project are the occurrence of intangible features and unrecorded cultural resources (of which graves, and subsurface cultural material are the highest risk). This can cause delays during construction, as well as additional costs involved in mitigation and possible layout changes. The stakeholder engagement process will assess intangible heritage resources further if this is listed as a concern.

### 10.5 Monitoring Requirements

Day to day monitoring can be conducted by the ECO. The ECO or other responsible persons should be trained along the following lines:

- *Induction training:*
  - Responsible staff identified by the developer should attend a short course on heritage management and identification of heritage resources.
  - Staff should also receive training on the CFP.
- *Site monitoring and watching brief*: As most heritage resources occur below surface, all earth-moving activities need to be routinely monitored in case of accidental discoveries. The greatest potential impacts are from pre-construction and construction activities. The ECO should monitor all such activities. If any heritage resources are found, the chance finds procedure must be followed as outlined above.

Table 12. Monitoring requirements for the Project

| Heritage Monitoring | | | | | |
|---|---|---|---|---|---|
| **Aspect** | **Area** | **Responsible for monitoring and measuring** | **Frequency** | **Proactive or reactive measurement** | **Method** |
| Cultural Heritage Resource Chance Find | Entire Project area | ECO | Weekly (Pre construction and construction phase) | Proactively | If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented:<br>1. Cease all works immediately;<br>2. Report incident to the Sustainability Manager;<br>3. Contact an archaeologist to inspect the site;<br>4. Report incident to the competent authority; and<br>5. Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities.<br>Only recommence operations once impacts have been mitigated. |

### 10.7 Management Measures for inclusion in the EMPr

**Table 13. Heritage Management Plan for EMPr implementation**

| Area | Mitigation measures | Phase | Timeframe | Responsible party for implementation | Target | Performance indicators (Monitoring tool) |
|---|---|---|---|---|---|---|
| General Project area | Monitoring of the Project area by the ECO during pre-construction and construction phases for chance finds, if chance finds are encountered to implement the Chance Find Procedure for the project | Pre-Construction & Construction | Weekly | Applicant Construction Contractor | Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34, 35, 36 and 38 of NHRA | ECO Checklist/Report |
| General Project Area | Development activities must be confined to the approved development footprint only. | Construction | Construction | Applicant Construction Contractor | Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA | ECO Checklist/Report |
| PFM001 | Avoidance of the burial sites is preferable with a 30 m buffer zone and demarcation of the features. An access protocol should be compiled for Next of Kin (NoK) who might want to visit the site as well as a grave management plan to ensure the site is protected. | Throughout the Project | Throughout the Project | Applicant Construction Contractor | Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA | ECO Checklist/Report |
| PFM002, PFM005, PFM009, PFM010, PF027 | Historical sites must be avoided with 30m buffer zone. | Throughout the Project | Throughout the Project | Applicant Construction Contractor | Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA | ECO Checklist/Report |

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# Palaeontological Impact Assessment for the proposed Phefumula Emoyeni One Up to 400kV Grid connection and MTS, Mpumalanga Province

## 41105236-Phefumula Emoyeni One

**Site Visit (Phase 2)**

**For**

**Beyond Heritage (Pty) Ltd**
**And WSP**

**11 October 2024; 12 February 2025**

**Prof Marion Bamford**
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za

## Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf, PSSA
Experience: 35 years research and lecturing in Palaeontology
27 years PIA studies and over 350 projects completed

## Declaration of Independence

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

Specialist: Prof Marion Bamford

Signature: *MKBamford*

## Executive Summary

A Palaeontological Impact Assessment was requested for the proposed Phefumulo One Electrical Grid connection infrastructure between Hendrina, Bethal and Ermelo, Mpumalanga Province. Approximately 36.37 km of up to 400 kV overhead powerlines will be constructed and associated on-site infrastructure to feed the energy produced by the Phefumula Emoyeni One Wind Energy Facility into the national grid.

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

The proposed route and site lie on the potentially very highly sensitive Vryheid Formation (Ecca Group, Karoo Supergroup) that might preserve fossil plants of the *Glossopteris* flora so a site visit walkdown and verification was carried by palaeontologists. They confirmed that there were no fossils visible on the land surface which is covered by soils and vegetation or has been ploughed for agriculture.

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

| ASPECT | SCREENING TOOL SENSITIVITY | VERIFIED SENSITIVITY | OUTCOME STATEMENT/ PLAN OF STUDY | RELEVANT SECTION MOTIVATING VERIFICATION |
|---|---|---|---|---|
| Palaeontology | Very High | Low | Palaeontological Impact Assessment | Section 7.2. SAHRA Requirements |

# Table of Contents

# 1. Background

Phefumula Emoyeni One Pty Ltd is proposing to develop the Phefumula Emoyeni One Wind Energy Facility (WEF) to be integrated to the national Grid with a 400kV grid connection and establishing a new 400/132kV Main Transmission Substation (MTS) as well as three distribution substations / switching stations in order to support the Phefumula Emoyeni One WEF. The project will be located approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa. The grid will be located over 126 farm portions and will be approximately 36.37km, as illustrated in Figure 1.

The project comprises the following infrastructure scope of work.

- Construct 2 x 1 km (estimated) 400 kV loop-in-loop-out of the existing Camden – Duvha 400 kV line 1 to the new proposed Main Transmission Substation.
- Establish a new 400/132kV Main Transmission Substation (MTS), with 2 x 400 kV feeder bays. 31Ha footprint.as shown in figure below The MTS to be equipped with 132 kV double busbars, 1 x 132 kV Bus coupler bay, 1 x 400/132 kV transformer bay, 1 x 500 MVA 400/132 kV transformer, and 3x132 kV feeder bays (for IPP integration).

- Establish 3 x Distribution (DX) substations (one per each phase). The IPP substation will be constructed adjacent to the Dx subs. Dx1-approx. 7.85Ha footprint
- Dx2- approx. 20.45Ha footprint
- Dx3- approx. 13.6Ha footprint

- Establish 3 x 132kV overhead lines (OHL) from each Dx sub to the MTS (total length approx. 7.6km) Dx1-approx.9.58km
- Dx2- approx. 22.4km
- Dx3- approx. 6.37km
- A 300m corridor (150m either side of centre line) must be assessed for each OHL.

**Table 1: Details of the Phefumula One Grid Infrastructure.**

| PROPOSED INFRASTRUCTURE | DETAILS |
|---|---|
| Up to 400kV transmission line | ▪ 400kV Loop-In-Loop-Out (LILO) OHL.<br>▪ Servitude width for 1 x up to 400kV transmission line is 60m for Loop-In-Loop-Out<br>▪ Height of 1 x 400kV power line structure is on average 48m, but may reach up to 50m in exceptional circumstances depending on the complexity and slope of the terrain.<br>▪ Minimum conductor clearance is between 8.1 and 12.6m.<br>▪ Span length between pylon structures is typically up to 100 - 250m apart, depending on complexity and slope of terrain.<br>▪ For up to 400kV structures footprint sizes may vary depending on design type up to 110m2 (10.5m by 10.5m), with concrete foundations of up to 80m2 and depths reaching up to 3.5m typically depending on the number and design of the foundations (to be determined during the detailed design |

| | |
|---|---|
| | engineering phase). The actual number of structures required will vary according to the final route alignment determined.<br>▪ Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design.<br>For safety reasons, transmission lines require certain minimum clearance distances. These are as follows:<br>▪ The minimum vertical clearance distance between the ground and the transmission line is 6.7m.<br>▪ The minimum vertical clearance to any fixed structure that does not form part of the transmission line is 9.4m - 11m.<br>▪ The minimum distance between an up to 400kV transmission line and an existing road is 60m – 120m (depending on the type of road).<br>▪ Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to. |
| Up to 132kV transmission lines | ▪ The servitude width for 1x up to 132kV transmission line is 31m. A 300m corridor must be assessed (150m on either side of the centre line) to allow for micro-siting. In the case of the Loop-In-Loop-Out alternative this servitude will apply to each of the two connecting power lines.<br>▪ The maximum height for an up to 132kV powerline structure is 40m.<br>▪ Pylon structures will be either monopole or lattice structures depending what is identified as appropriate during final design.<br>▪ Pylon structures may require anchors with guy-wires or be anchorless.<br>▪ For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80m2 (10m by 8m), with depths reaching up to 3.5m typically in a rectangular 'pad' shape.<br>▪ A working area of approximately 100m x 100m is needed for each of the proposed structures to be constructed. |
| Main Transmission substation (MTS) (Approx. 31Ha) | ▪ A high voltage substation yard to allow for multiple 132kV and 400kV feeder bays and transformers, with infrastructure to allow for step-up to 400kV as required.<br>▪ Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed.<br>▪ The control building, telecommunication infrastructure, oil dam(s) etc,<br>▪ Workshop and office area within the collector substation footprint,<br>▪ Fencing around the Substation |

| | |
|---|---|
| | ▪ All the access road infrastructure to and within the substation |
| Three Distribution Substations | ▪ Dx1-approx. 7.85Ha footprint<br>▪ Dx2- approx. 20.45Ha footprint<br>▪ Dx3- approx. 13.60Ha footprint |
| Temporary/ construction phase infrastructure | ▪ Construction compound at the MTS (3ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.)<br>▪ 3 x construction compound / laydown areas, including site office of 3ha each at each of the Dx locations (150m x 200m each) (including conservancy tank for ablutions)<br>▪ Batch plant of 4-7 ha (unless a commercial source is used and concrete trucked to site, preferable to keep options open)<br>▪ Portable ablution facilities will be used along the powerline routes |

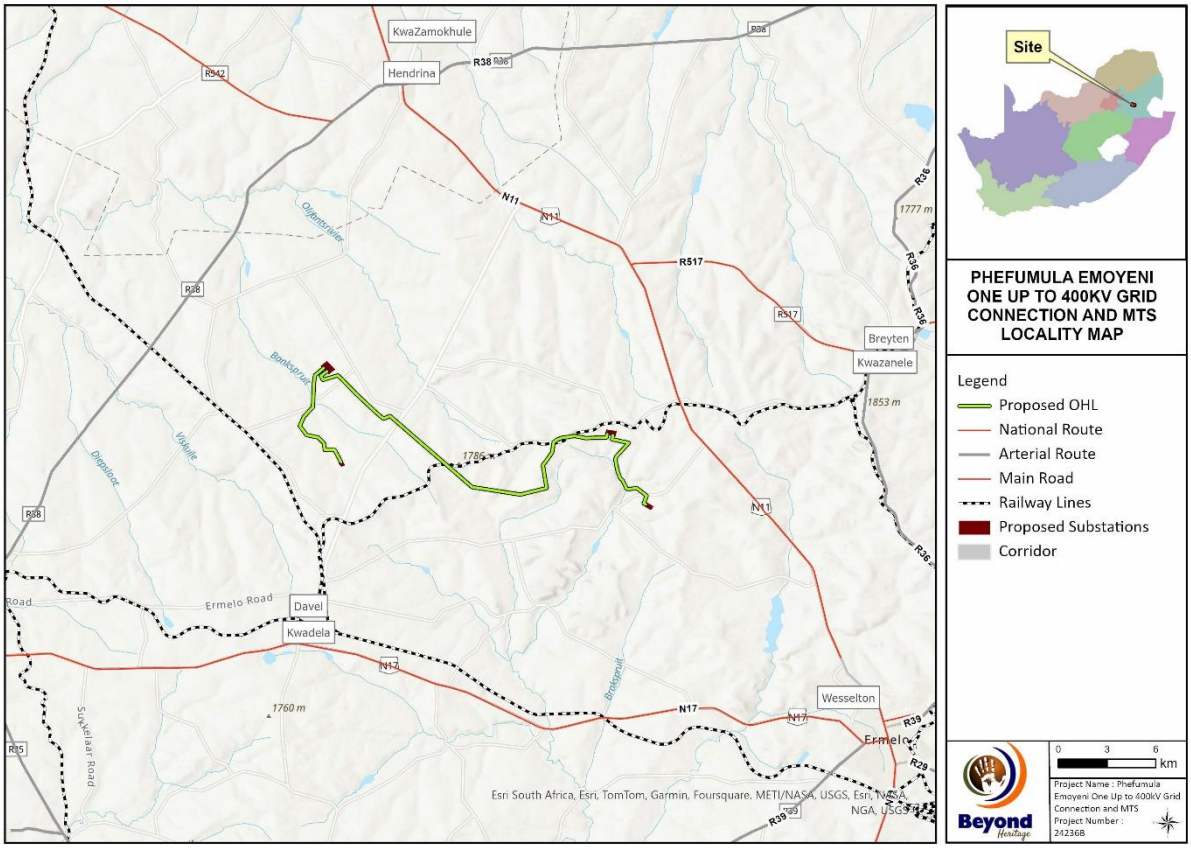


**Figure 1: Regional map for the proposed Phefumula One Grid route and infrastructure. Map supplied by Beyond Heritage.**

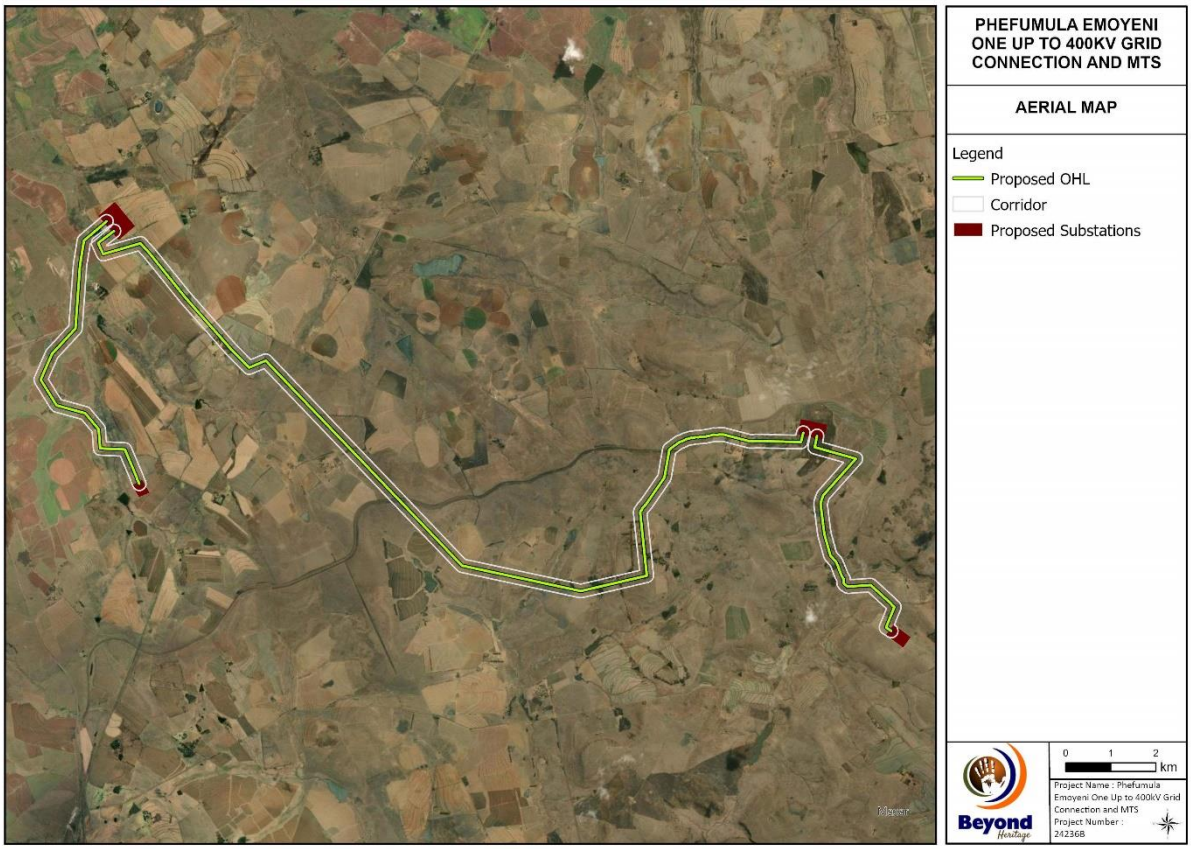


**Figure 2: Aerial Map of the proposed Phefumula One Grid OHPL route. Map supplied by Beyond Heritage.**

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

**Table 2: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6). Includes the requirements from GNR Appendix 6 of GN 326 EIA Regulation 2017**.

| | **A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:** | **Relevant section in report** |
|---|---|---|
| ai | Details of the specialist who prepared the report, | Appendix B |
| aii | The expertise of that person to compile a specialist report including a curriculum vitae | Appendix B |
| b | A declaration that the person is independent in a form as may be specified by the competent authority | Page 1 |

| | **A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:** | **Relevant section in report** |
|---|---|---|
| c | An indication of the scope of, and the purpose for which, the report was prepared | Section 1 |
| ci | An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report | Yes |
| cii | A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change | Section 5 |
| d | The date and season of the site investigation and the relevance of the season to the outcome of the assessment | N/A |
| e | A description of the methodology adopted in preparing the report or carrying out the specialised process | Section 2 |
| f | The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure | Section 4 |
| g | An identification of any areas to be avoided, including buffers | N/A |
| h | A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | N/A |
| i | A description of any assumptions made and any uncertainties or gaps in knowledge; | Section 5 |
| j | A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment | Section 4 |
| k | Any mitigation measures for inclusion in the EMPr | Section 8, Appendix A |
| l | Any conditions for inclusion in the environmental authorisation | N/A |
| m | Any monitoring requirements for inclusion in the EMPr or environmental authorisation | Section 8, Appendix A |
| ni | A reasoned opinion as to whether the proposed activity or portions thereof should be authorised | Section 6 |
| nii | If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan | Sections 6, 8 |
| o | A description of any consultation process that was undertaken during the course of carrying out the study | N/A |
| p | A summary and copies of any comments that were received during any consultation process | N/A |
| q | Any other information requested by the competent authority. | N/A |
| 2 | Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply. | N/A |

# 2. Methods and Terms of Reference

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

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases; eg https://sahris.sahra.org.za/map/palaeo
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*applicable to this assessment*); and
4. Determination of fossils' representativity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*applicable to this assessment*).

**2a LEGISLATION**

For this project, the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is of importance and the following sites and features are protected:

- Archaeological artefacts, structures and sites older than 100 years.
- Ethnographic art objects (e.g. prehistoric rock art) and ethnography.
- Objects of decorative and visual arts.
- Military objects, structures and sites older than 75 years.
- Historical objects, structures and sites older than 60 years.
- Proclaimed heritage sites.
- Grave yards and graves older than 60 years.
- Meteorites and fossils.
- Objects, structures and sites or scientific or technological value.
- The national estate includes the following:
- 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 features of cultural significance.
- Geological sites of scientific or cultural importance.
- Archaeological and palaeontological importance.
- Graves and burial grounds.
- Sites of significance relating to the history of slavery.
- Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.).

Section 34 (1) of the act deals with structures which is older than 60 years. Section 35(4) of this act deals with archaeology, palaeontology and meteorites. Section 36(3) of the NHRA deals with human remains older than 60 years. Unidentified/unknown graves are also handled as older than 60 until proven otherwise.

**2b Palaeontological Site Significance and Mitigation Measures**

- Fossils tend to be distributed within a geological stratum or formation, not to a single site, although they be visible or exposed in one site, within the landscape. However, in practice their distribution is not uniform and is not predictable because many taphonomic features come into play. Fossils are non-renewable but some are very abundant, some are common, some are poorly preserved and some are rare and very important for understanding the biostratigraphy and evolution of the organism and the palaeoecology.
- There is no list of criteria for assessing the importance of fossils in South Africa and may come down to the personal preference of the palaeontologist. A more general approach, therefore, is used here to establish site significance:
- The unique nature of a site;
- The integrity of the palaeontological deposit;
- The preservation of the fossils: complete animal or plant, or partial skeletons or separate plant parts, identifiable fragments of animal or plant, or unidentifiable fragments.
- The location of the site in relation to other similar sites or features;
- The depth of the deposit (when it can be determined or is known);
- The preservation condition of the site as a whole; and
- Potential to answer present research questions.

# 3. Geology and Palaeontology

## i. Project location and geological context

The project lies in the central part of the main Karoo Basin where the basal rocks have been intruded by dolerite of Jurassic age. Much younger sands and alluvium of Quaternary age have accumulated in some depressions and river valleys (Figure 3).

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

Overlying the basal Dwyka Group glacigene rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the central and eastern part are the following formations, from base upwards: Pietermaritzburg, **Vryheid** and Volksrust Formations. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments.

Overlying the Ecca Group are the rocks of the Beaufort Group that has been divided into the lower Adelaide Subgroup for the Upper Permian strata, and the Tarkastad Subgroup for the Early to Middle Triassic strata. As with the older Karoo sediments, the formations vary across the Karoo Basin.

Large exposures of Jurassic dolerite dykes occur throughout the area. These intruded through the Karoo sediments around 183 million years ago at about the same time as the Drakensberg basaltic eruption.

Younger sands and alluvium that have eroded from the older rocks have accumulated in some of the river valleys and depressions during the Quaternary period. These sediments are hard to date as they have been weathered, eroded and transported

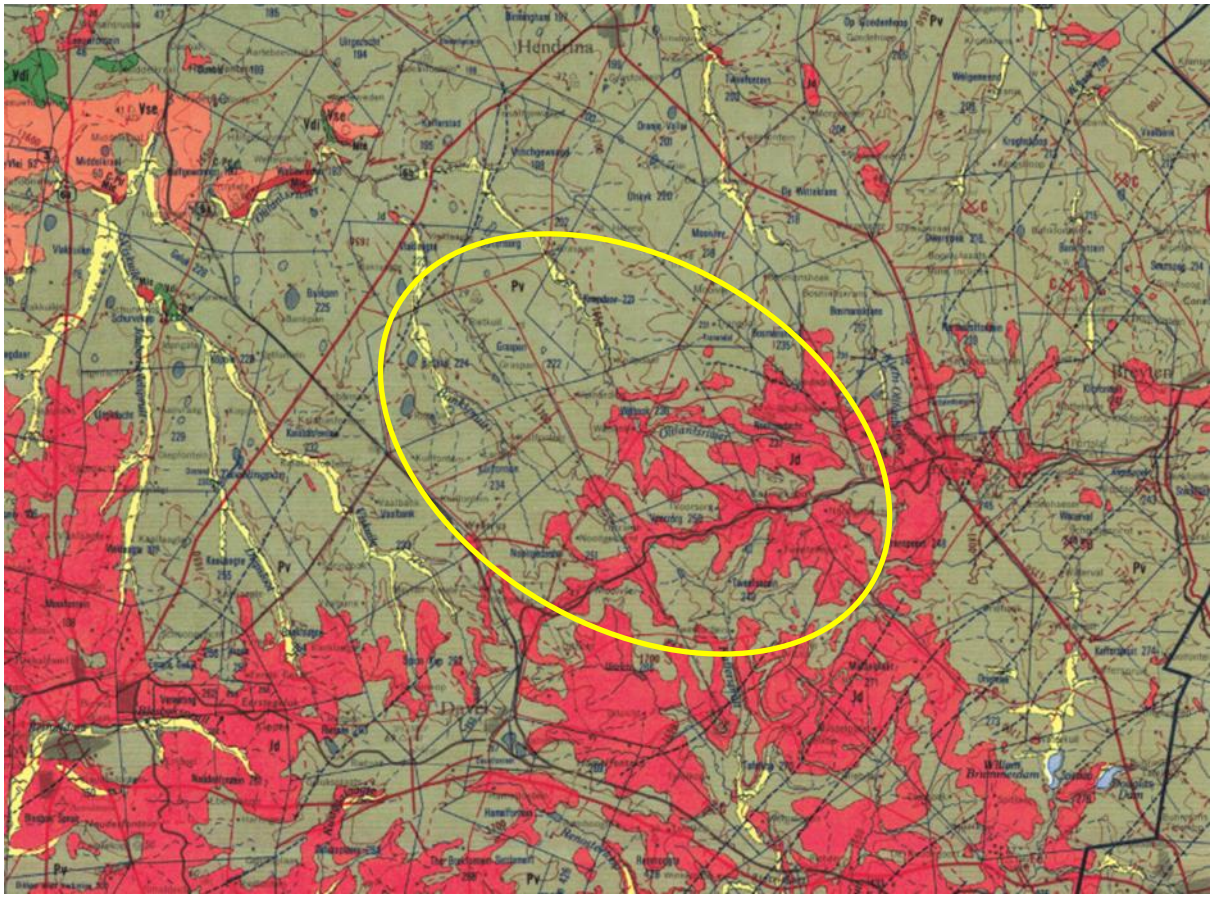


**Figure 3: Geological map of the area around the Phefumula One Grid infrastructure indicated within the yellow outline. Abbreviations of the rock types are explained in Table 3. Map enlarged from the Geological Survey 1: 250 000 map 2628 East Rand**

Table 3: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006; Partridge et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

| Symbol | Group/Formation | Lithology | Approximate Age |
|---|---|---|---|
| Q | Quaternary | Alluvium, sand, calcrete | Quaternary<br>Ca 1.0 Ma to present |
| Jd | Jurassic dykes | Dolerite dykes, intrusive | Jurassic,<br>approx. 183 Ma |

| Symbol | Group/Formation | Lithology | Approximate Age |
|---|---|---|---|
| Pv | Vryheid Fm, Ecca Group, Karoo SG | Shale, mudstone, coal, sandstone | Middle Permian ca 266 – 260 Ma |

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The site for development is in the potentially very highly sensitive Vryheid Formation (red) and the non-fossiliferous Jurassic dolerite (grey).

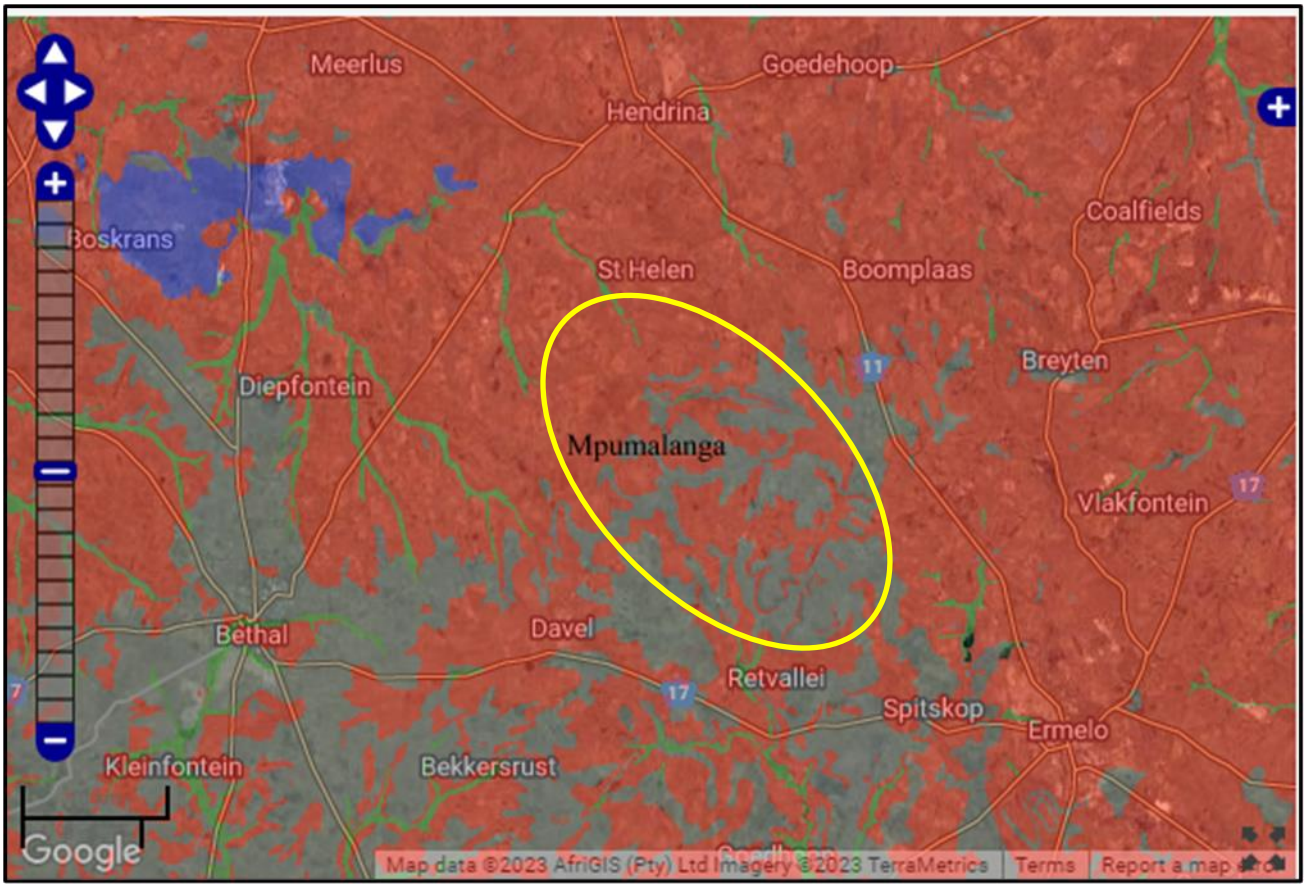


**Figure 4: SAHRIS palaeosensitivity map for the site for the proposed Phefumulo One Grid infrastructure shown within the yellow outline. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.**

The Vryheid Formation lies on the uneven topography of pre-Karoo or Dwyka Group rocks in the northern and northwestern margins, but lies directly on the Pietermaritzburg Formation in the central and eastern part. The lithofacies show a number of upward-coarsening cycles, some very thick, and they are essentially deltaic in origin. There are also delta-front deposits, evidence of delta switching, and fluvial deposits with associated meandering rivers, braided streams, back swamps or interfluves and abandoned channels (Cadle et al., 1993; Cairncross, 1990; 2001; Johnson et al., 2006). Coal seams originated where peat swamps developed on broad abandoned alluvial plains,

and less commonly in the back swamps or interfluves. Most of the economically important coal seams occur in the fluvial successions (ibid). In the east (Mpumalanga and northern KwaZulu Natal), the Vryheid formation can be subdivided into a lower fluvial-dominated deltaic interval, a middle fluvial interval, and an upper fluvial-dominated deltaic interval again (Taverner-Smith et al., 1988).

The Vryheid Formation preserves the distinctive Gondwanan flora, the *Glossopteris* flora. As the climate warmed up and the huge continent drifted polewards the land was rapidly colonised by luxuriant vegetation, in some parts. Peats formed in waterlogged environments and over time were buried, preserved and altered by heat and pressure to eventually form the coal seams typical of this formation and abundant in Mpumalanga and KwaZulu Natal coalfields. Coals themselves do not preserve the original plant structures, but plant impressions or compressions can be preserved in the lenses between the coals or in fine grained sediments. The flora is composed of the dominant *Glossopteris* plants (leaves, seeds, reproductive structures, roots and wood),

Dolerite is an intrusive volcanic rock originating from the molten lavas far below the surface. Because it is igneous in origin, rather than sedimentary, dolerite does not preserve fossils, in fact it tends to destroy any fossils within the sediments through which it has intruded. The dolerite, therefore, has no fossils and zero palaeosensitivity.

### iii. Site Visit Observations

The site was visited and walked down covering as much area as possible but not all the sections were accessible. Nonetheless, a representative overview was achieved. Much of the area has been cultivated in the past and is still under cultivation, attesting to the deep cover of soils suitable for agriculture.

There were very few rocky outcrops and these were composed of non-fossiliferous dolerite as it is more resistant to weathering than the Ecca shales. Since much of the area is covered by soils the potentially fossiliferous shales were not exposed. Surface shales have probably weathered to form soils but well below the ground surface there may be intact shales with fossils BUT these would no be visible until excavations commence.

In summary, NO FOSSILS were seen on the land surface. Site visit photographs are presented in Figures 5-8 below.

**Figure 5: Site visit photographs. General area showing the open grasslands and some powerlines. Note no rocky outcrops and no fossils visible in the land surface.**


**Figure 6: Site visit photographs. General area showing the open grasslands and some powerlines. Note no rocky outcrops and no fossils visible in the land surface.**


**Figure 7:. Site visit photographs. General area showing the open grasslands and some powerlines. Note no rocky outcrops and no fossils visible in the land surface.**


**Figure 8: Site visit photographs. General area showing the open grasslands and some powerlines. Note no rocky outcrops and no fossils visible in the land surface.**

# 4. Impact assessment

WSP Method for Assessment of Impacts and Mitigation

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

Following the mitigation sequence/hierarchy of five levels:

a) Avoid/prevent significant impact
b) Minimise
c) Rehabilitate/restore
d) Off-set
e) No-go,

With mitigation in the form of removing any important fossils (steps a and b) will reduce considerably the impact of this project on the palaeontological heritage.

The key objectives of the risk assessment are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Ranked criteria listed in Table 4a and the scores for the palaeontological impact are given in Table 4b.

**Table 4a: Impact Assessment and Scoring according to WSP protocols.**

| CRITERIA | SCORE 1 | SCORE 2 | SCORE 3 | SCORE 4 | SCORE 5 |
|---|---|---|---|---|---|
| Impact Magnitude (M)<br>The degree of alteration of the affected environmental receptor | Very low:<br>No impact on processes | Low:<br>Slight impact on processes | Medium:<br>Processes continue but in a modified way | High:<br>Processes temporarily cease | Very High:<br>Permanent cessation of processes |
| Impact Extent (E) The geographical extent of the impact on a given environmental receptor | Site: Site only | Local: Inside activity area | Regional:<br>Outside activity area | National:<br>National scope or level | International:<br>Across borders or boundaries |
| Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change | Reversible:<br>Recovery without rehabilitation | | Recoverable:<br>Recovery with rehabilitation | | Irreversible:<br>Not possible despite action |
| Impact Duration (D) The length of permanence of the impact on the environmental receptor | Immediate:<br>On impact | Short term:<br>0-5 years | Medium term:<br>5-15 years | Long term:<br>Project life | Permanent:<br>Indefinite |
| Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation | Improbable | Low Probability | Probable | Highly Probability | Definite |
| Significance (S) is determined by combining the above criteria in the following formula: | $[S = (E + D + R + M) \times P]$<br>$Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$ | | | | |
| IMPACT SIGNIFICANCE RATING | | | | | |
| Total Score | 4 to 15 | 16 to 30 | 31 to 60 | 61 to 80 | 81 to 100 |
| Environmental Significance Rating (Negative (-)) | Very low | Low | Moderate | High | Very High |
| Environmental Significance Rating (Positive (+)) | Very low | Low | Moderate | High | Very High |

**Table 4b: Impact Assessment score and significance for Palaeontology for the Phufumulo One Grid infrastructure project.**

| Project: | | |
|---|---|---|
| Criteria (from table above) | Scores | |
| | Pre-mitigation | Post-mitigation |
| Impact Magnitude (M) | 3 | 1 |
| Impact Extent (E) | Site only 1 | Site only 1 |

| | | |
|---|---|---|
| Impact Reversibility (R) | 3 | 3 |
| Impact Duration (D) | Short 3 | Short 3 |
| Probability of Occurrence (P) | Low 2 | Low 2 |
| Significance (M+E+R+D) x P | (3+1+3+3) x 2 | (1+1+3+3)2 |
| Significance Rating | 20 | 16 |
| Negative / Positive | Low negative | Low positive |

**Mitigation**
The impact on the palaeontological heritage can be reduced greatly by a palaeontologist conducting a pre-construction site visit to look for fossils and removing any scientifically important fossils, at this stage or in a subsequent visit, with the relevant SAHRA permit (See Section 8 and Appendix A).

**Positive/Negative Impact**
The discovery and removal of fossils as a direct result of this project has a positive impact because prior to this the particular fossils or fossil deposit were unknown to science.

**Additional Environmental Impacts**
As far as the palaeontology is concerned, there are no additional impacts because the fossils are inert and inactive.

**Cumulative Impacts**
As far as the palaeontology is concerned, there are no cumulative impacts because each site is unique and may or may not have fossils. Fossil bones may be scattered over the landscape but their distribution is erratic and unpredictable. If a bone-bed or plant outcrop occurs this would an aerially small concentration of fossils and very unlikely to extend beyond tens of metres. Therefore, projects on adjacent land parcels are unlikely to add any impact on this project.

**No-Go areas**
There are NO no-go areas because the fossils, if present, can be removed ad curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material.

**Impact Phase**
It is only the **Construction Phase** that there could be any impact on the palaeontological heritage because this is when the ground will be broken for excavations for foundations and infrastructure. Fossils occur in the ground. The operational and de-commissioning phases will not affect the palaeontology.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the underground rocks are the correct type and age to contain fossils but they are not common and their distribution is unpredictable. The land is covered with soils that do not preserve fossils. Since there is a chance that fossils from below ground in the Vryheid Formation may be disturbed a Fossil Chance Find Protocol has been added to this report.

Taking account of the defined criteria, the potential impact to fossil heritage resources is low.

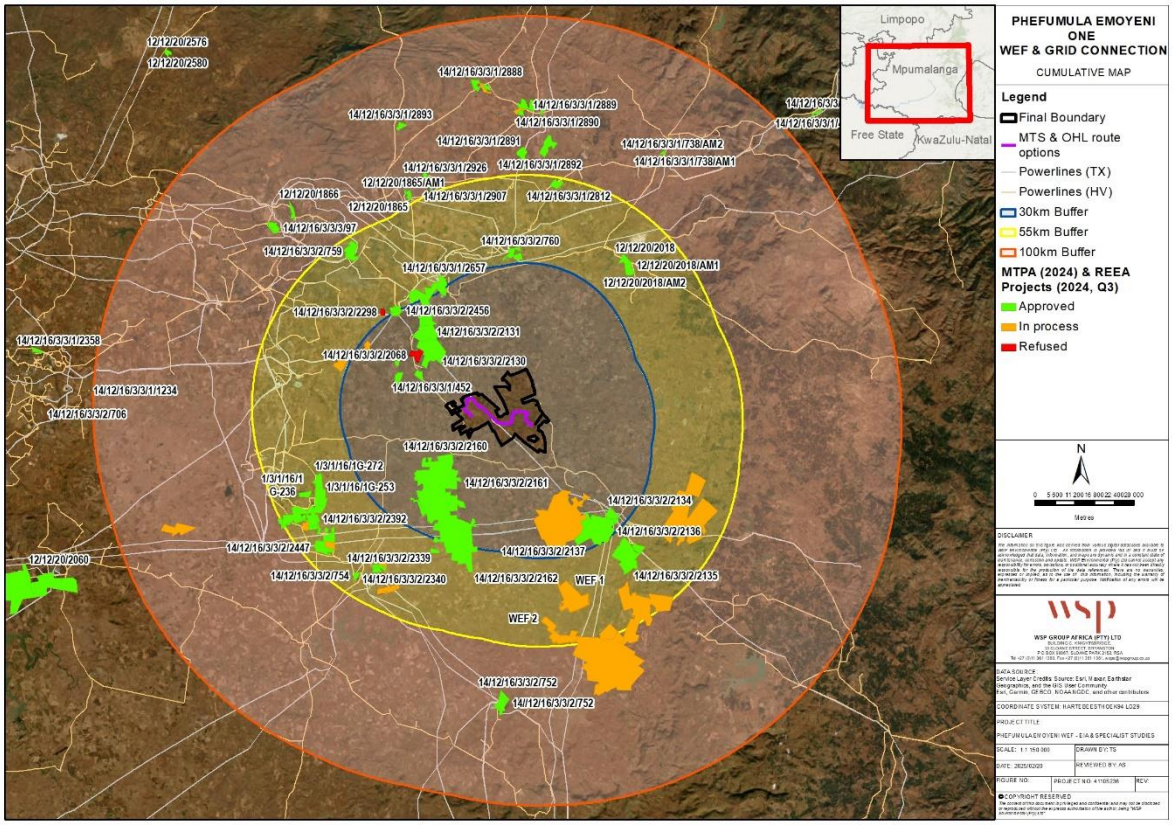


**Figure 9: Map of Wind and Solar energy facilities in the vicinity of the Phefumulo Emoyeni One WEF and Grid infrastructure.**

# 5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and only some might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils. The land is covered with Quaternary soils and alluvium and it is not known what lies beneath them until excavations commence.

# 6. Recommendation

Based on the site visit walkdown, experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary. There is a very small chance that fossils may occur in below the soils in the unweathered mudstones, siltstones and shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible

person once excavations or drilling activities have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low, so as far as the palaeontology is concerned, the project should be authorised.

As far as the palaeontology is concerned there are no preferred routes, there are no no-go areas and no buffers required and there is no cumulative impact.

| ASPECT | SCREENING TOOL SENSITIVITY | VERIFIED SENSITIVITY | OUTCOME STATEMENT/ PLAN OF STUDY | RELEVANT SECTION MOTIVATING VERIFICATION |
|---|---|---|---|---|
| Palaeontology | Very High | Low | Palaeontological Impact Assessment | Section 7.2. SAHRA Requirements |

# 7. References


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# 8. Chance Find Protocol

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

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone or coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 10). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

# 9. Appendix A – Examples of fossils from the Vryheid Formation


**Figure 10: Photographs of fossil plants from the Vryheid Formation to assist the responsible person on site.**

# 10. Appendix B – Details of specialist

STATEMENT OF COMPETENCY

The author of the report is a member of the professional society, the Palaeontological Association of Southern Africa (PSSA) and has served as the president in the past (Note: The PSSA does not yet have an accreditation system like ASAPA does). She holds a PhD in Palaeontology (Wits:1990), is the Director of the Evolutionary Studies Institute in the University of the Witwatersrand, lectures palaeobotany to undergraduate students and supervises postgraduate students. She has published over 180 scientific works and reviews manuscripts and funding proposals for local and international bodies. She has been doing palaeontological impact assessments for more than 25 years and has completed over 350 desktop and site reports for mining, energy, roads and infrastructure.

STATEMENT OF INDEPENDENCE

I, Marion Bamford, subcontracted by Beyond Heritage, hereby confirm my independence as a specialist and declare that I do have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which the client was

appointed as the EAP, other than fair remuneration for work performed on this project. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision-making process for the Project.

SIGNATURE: