

# HERITAGE IMPACT ASSESSMENT

(REQUIRED UNDER SECTION 27 & 38(1) OF THE NHRA (No. 25 OF 1999))

FOR THE PROPOSED VLNR WEATHER TOWER, LIMPOPO PROVINCE

**Type of development:**

Weather Tower

**Client:**

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**Environmental Impact Practitioner information:**

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**Developer:**

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Project Reference:

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January 2022

## APPROVAL PAGE

<b>Project Name</b>	VLNR Weather Tower
<b>Report Title</b>	Heritage Impact Assessment for the VLNR Weather Tower, Limpopo Province
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<b>Applicant Name</b>	De Beers Consolidated Mines (Pty) Ltd

<b>Responsibility</b>	<b>Name</b>	<b>Qualifications and Certifications</b>	<b>Date</b>
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<b>Paleontological Assessment</b>	Prof Marion Bamford	PhD Paleo Botany	January 2022

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**Amendments on Document**

Date	Report Reference Number	Description of Amendment

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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 - (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Section a Section 12
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	<i>Declaration of Independence p6</i>
(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 and 7.1.
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	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 8 and 9
(g) Identification of any areas to be avoided, including buffers	Section 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
(l) Description of any assumptions made and any uncertainties or gaps in knowledge	Section 3.6
(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 10
(l) Conditions for inclusion in the environmental authorisation	Section 10
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 10. 5.
(n) Reasoned opinion - (i) as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (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 10.3
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Section 6
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	NA
(q) Any other information requested by the competent authority	NA

## Executive Summary

Alta van Dyk Environmental Consultants was appointed by De Beers to facilitate the required heritage studies for the proposed VLNR Weather Tower, owned by De Beers Consolidated Mines (Pty) Ltd (De Beers). The Tower is located within the Venetia Limpopo Nature Reserve (VLNR), Limpopo Province. The proposed weather radar tower is required for Venetia to receive advancing warning of a severe storm event as part of an early flood warning system for the safety of the underground workers and workings. The proposed development activities do not trigger the listed activities that require an Environmental Authorisation (EA) in terms of the National Environment Management Act, Act No.107 of 1998 (NEMA), and the NEMA EIA 2014 Regulations. However, an approval on the project is sought from the South African Heritage Resources Agency (SAHRA) due its proximity (within 10 km) to the Mapungubwe National Park (MNP), which is a declared National Heritage Site (NHS) and a World Heritage Site (WHS). Beyond Heritage was appointed to conduct a Heritage Impact Assessment (HIA) for the project and the study area was assessed on desktop level and by a non-intrusive pedestrian field survey. Key findings of the assessment include:


- The proposed project is located on the Farm Faure 33 MS 10km of the Mapungubwe National Park;
- Heritage finds were limited to isolated scatters of Middle Stone Age (MSA) artefacts. The artefacts area out of context and scattered too sparsely to be of significance apart from mentioning them in this report;
- According to the South African Heritage Resource Information System (SAHRIS) the study area is of moderate paleontological sensitivity and an independent desktop study was conducted by Prof Marion Bamford;
- No other heritage features (archaeological, built environment or graves) of significance were recorded during the field assessment;
- A visual assessment was conducted for the project and the assessment found that the proposed project will have a moderate visual impact during all phases, prior to mitigation measures being implemented. With the implementation of mitigation measures as outlined in the VIA, the visual impact on the receiving environment may be lowered to low significance visual impacts. Based on the outcome of the visual assessment the author recommend that the proposed weather radar tower may be considered for authorisation with the knowledge that the significance of risk to the receiving environment is limited.

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

## Recommendations:

- Implementation of a chance find procedure for the project for both the cultural heritage and paleontological components.

**Declaration of Independence**

<b>Specialist Name</b>	Jaco van der Walt
<b>Declaration of Independence</b>	<p>I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that I:</p> <ul style="list-style-type: none"> <li>• I act as the independent specialist in this application;</li> <li>• 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;</li> <li>• I declare that there are no circumstances that may compromise my objectivity in performing such work;</li> <li>• 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;</li> <li>• I will comply with the Act, Regulations and all other applicable legislation;</li> <li>• I have no, and will not engage in, conflicting interests in the undertaking of the activity;</li> <li>• 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;</li> <li>• All the particulars furnished by me in this form are true and correct; and</li> <li>• I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.</li> </ul>
<b>Signature</b>	
<b>Date</b>	2022/01/20

**a) Expertise of the specialist**

Jaco van der Walt has been practising as a CRM archaeologist for 15 years. He obtained an MA degree in Archaeology from the University of the Witwatersrand focussing on the Iron Age in 2012 and is a PhD candidate at the University of Johannesburg focussing on Stone Age Archaeology with specific interest in the Middle Stone Age (MSA) and Later Stone Age (LSA). Jaco is an accredited member of ASAPA (#159) and have conducted more than 500 impact assessments in Limpopo, Mpumalanga, North West, Free State, Gauteng, KZN as well as he Northern and Eastern Cape Provinces in South Africa.

Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, DRC Zambia, Guinea and Tanzania. Through this, he has a sound understanding of the IFC Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage.

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**ABBREVIATIONS**

ASAPA: Association of South African Professional Archaeologists
BGG Burial Ground and Graves
BIA: Basic Impact Assessment
CFPs: Chance Find Procedures
CMP: Conservation Management Plan
CRR: Comments and Response Report
CRM: Cultural Resource Management
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
EAP: Environmental Assessment Practitioner
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact 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
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)

Early 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 recently, 100 years ago)

The Iron Age (~ AD 400 to 1840)

Historic (~ AD 1840 to 1950)

Historic building (over 60 years old)

## 1 Introduction and Terms of Reference

De Beers Consolidated Mines (Pty) Ltd (De Beers) is planning to install a weather radar tower at its Venetia Limpopo Nature Reserve (VLNR), in conjunction with the South African Weather Services (SAWS) to assist the mine with weather tracking and forecasting. The proposed weather radar tower is required for Venetia to receive advancing warning of a severe storm event as part of an early flood warning system for the safety of the underground workers and workings. Beyond Heritage was appointed to conduct a HIA for the proposed project on the Farm Faure 33 MS in the Limpopo Province (Figure 1.1 to 1.3).

The aim of the study is to survey the proposed development footprint to identify cultural heritage sites, document, and assess their importance within local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to 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. It is also conducted to protect, preserve and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999). 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, isolated MSA artefacts were recorded. General site conditions and features on sites were recorded by means of photographs, GPS locations and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report. SAHRA as a commenting authority under section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) require all environmental documents to be submitted to SAHRA for commenting. Upon submission to SAHRA the project will be automatically given a case number as reference.

### 1.1 Terms of Reference

#### Field study

Conduct a field study to: (a) locate, identify, 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 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 ASAPA.

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).

## 1.2 Project Description

De Beers Consolidated Mines (Pty) Ltd (De Beers) is planning to install a weather radar tower at its Venetia Limpopo Nature Reserve (VLNR), in conjunction with the South African Weather Services (SAWS) to assist the mine with weather tracking and forecasting. Project components is outlined under Table 2 and 3 and the project location illustrated in Figure 1.1 to 1.3.

**Table 2: Project Description**

<b>Property Details</b>	The Farm Faure 33 MS in the Limpopo Province
<b>Magisterial District</b>	Musina Local Municipality, Vhembe District
<b>Central co-ordinate of the development</b>	Two options are being considered and the approximate locations are as follows: Option 1 - 22°15'59.18"S and 29°19'49.45"E Option 2 - 22°15'59.76"S and 29°19'53.73"E
<b>Topographic Map Number</b>	2229 BA

**Table 3: Infrastructure and project activities**

<b>Type of development</b>	Weather Tower
<b>Size of development</b>	The proposed weather radar tower will be between 20 – 40m in height, with a footprint area of approximately 900 m2 (30 x 30 m).
<b>Project Components</b>	An existing farm road will be used to gain access to the proposed site, and an existing powerline will be utilised for electricity supply. No reservoirs will be developed as part of this project, and a maximum of 1 000l (1 m3) of diesel will be stored on site.

## 1.3 Alternatives

Two alternatives were assessed as shown in Figure 1.2 & 1.3.

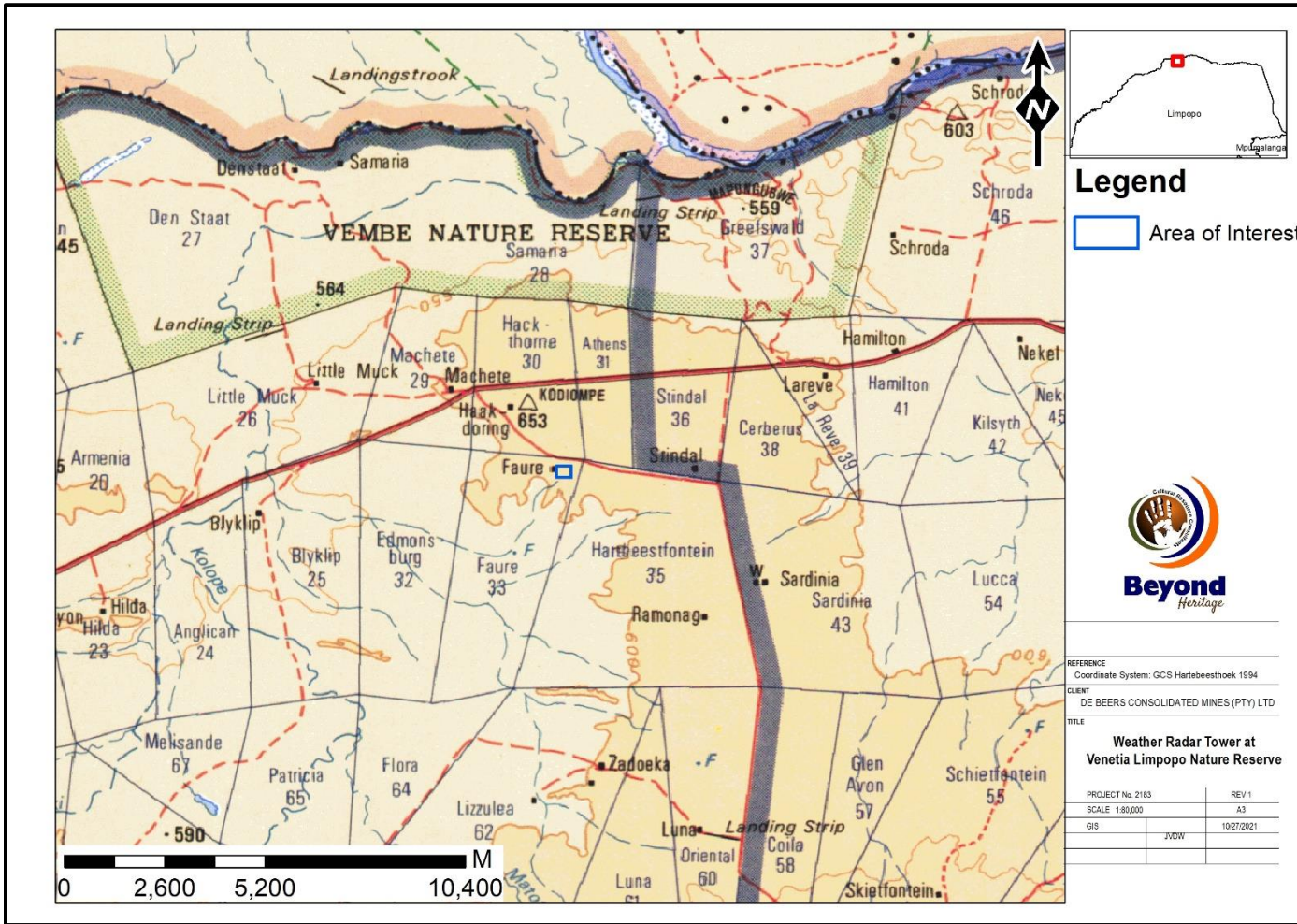


Figure 1.1. Regional setting (1: 250 000 topographical map) of the project.

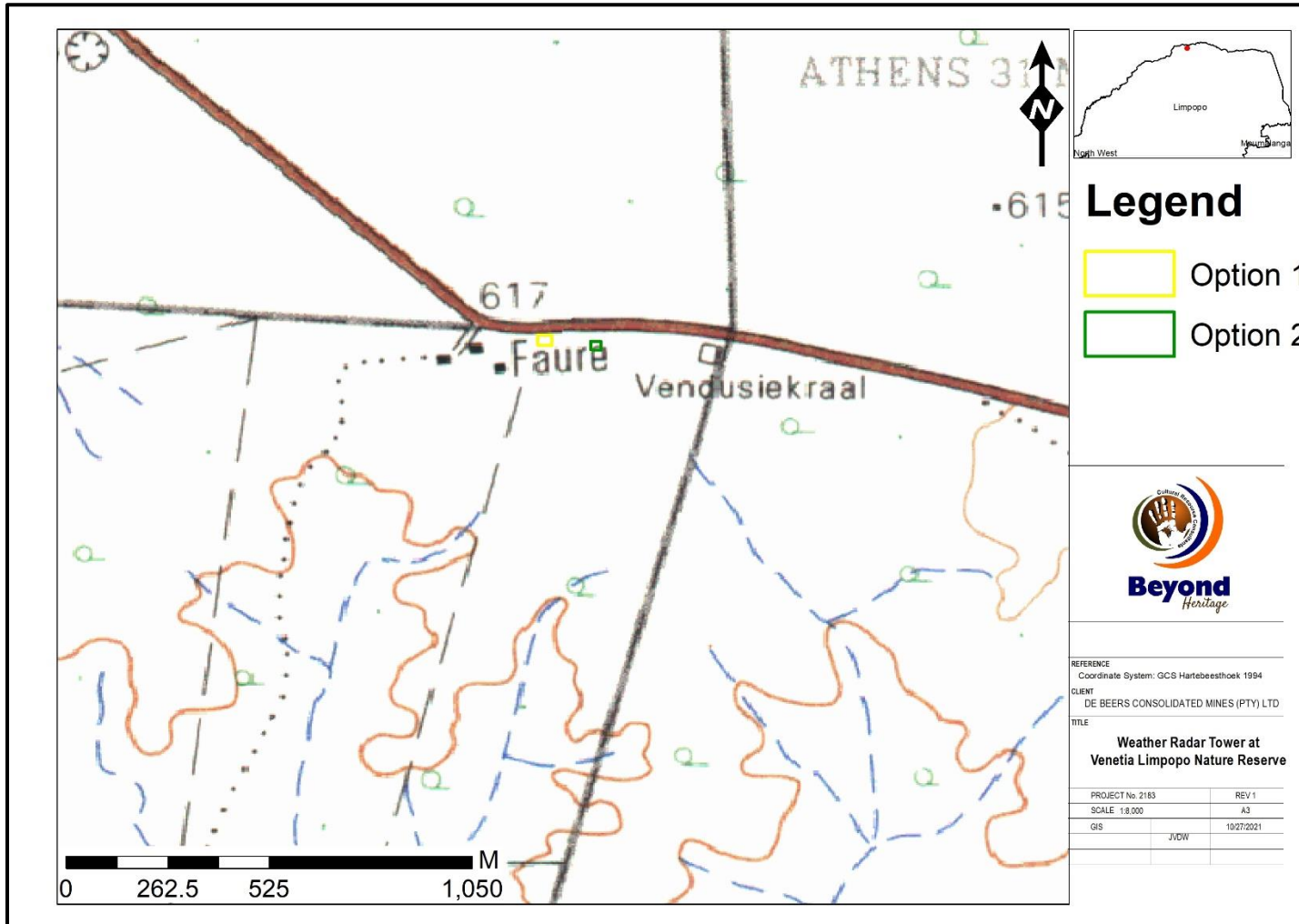


Figure 1.2. Local Setting of the project (1:50 000 topographical map).

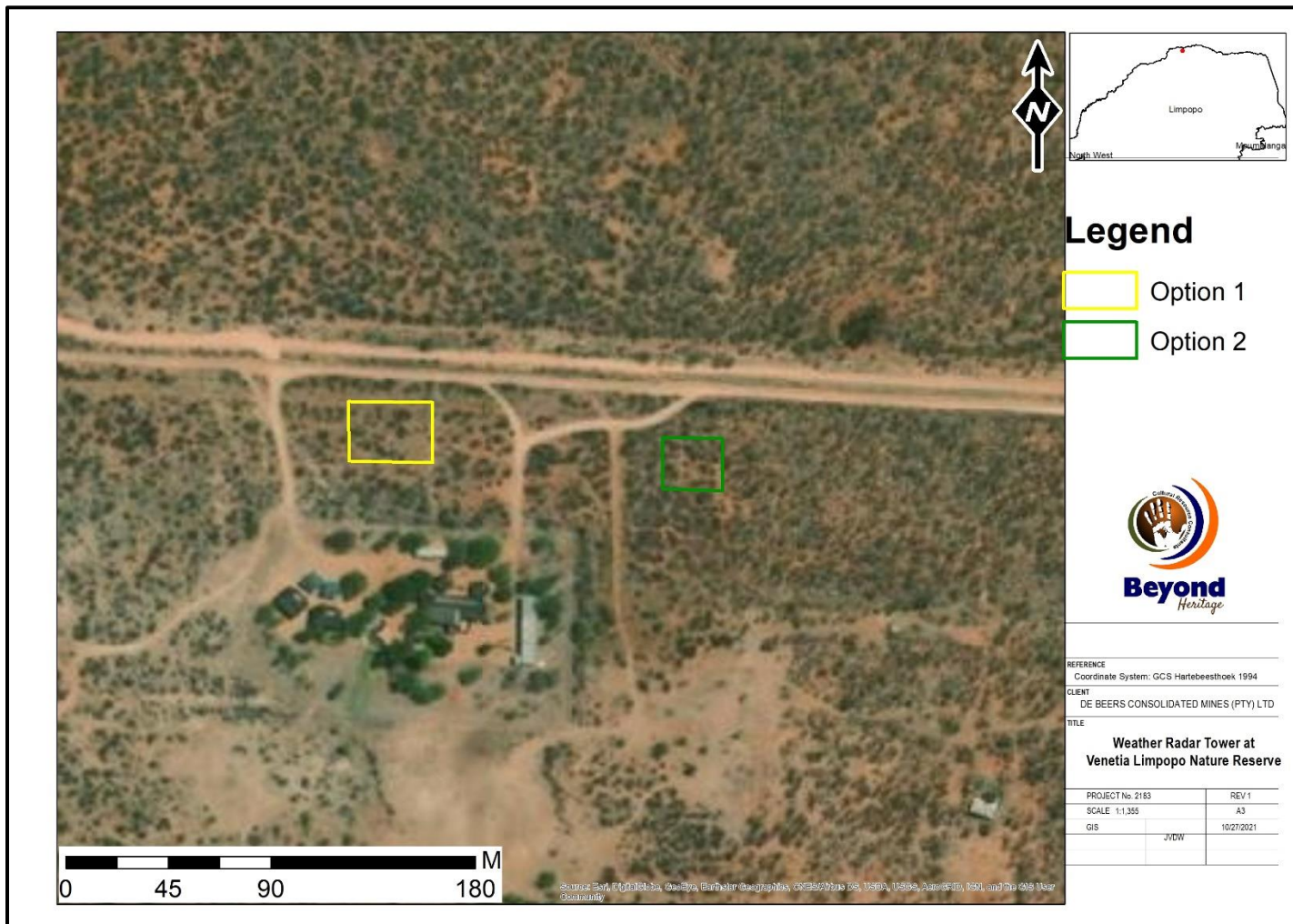


Figure 1.3. Aerial image of the development footprint.



## 2 Legislative Requirements

The HIA, as a specialist sub-section of 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)
- Mineral and Petroleum Resources Development Act (MPRDA), Act No. 28 of 2002 - Section 39(3)(b)(iii)

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;
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess the negative and positive impact of the development on these resources; and
- Make recommendations for the appropriate heritage management of these impacts.

The HIA should be submitted to the PHRA if established in the province or to 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 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.

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 HIA's 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. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 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. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act), as well as the Human Tissues Act (Act 65 of 1983) 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), as well as the Human Tissues Act (Act 65 of 1983) 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. This function is usually delegated to the Provincial MEC for Local Government and Planning; or in some cases, the MEC for Housing and Welfare. 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 Section 24 of Act 65 of 1983 (Human Tissues Act).

### **3 METHODOLOGY**

#### **3.1 Literature Review**

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).

#### **3.2 Genealogical Society and Google Earth Monuments**

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located; these locations were marked and visited during the fieldwork phase. The database of the Genealogical Society was consulted to collect data on any known graves in the area.

#### **3.3 Public Consultation and Stakeholder Engagement:**

No public consultation was conducted by the author of this report.

#### **3.4 Site Investigation**

The aim of the site visit was to:

a) survey the proposed project area to locate, identify, 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**

	<b>Site Investigation</b>
Date	30 November 2021
Season	Spring – Vegetation in the study area would not influence the survey and the development footprint was sufficiently covered to understand the heritage character of the area. (Figure 3.1).

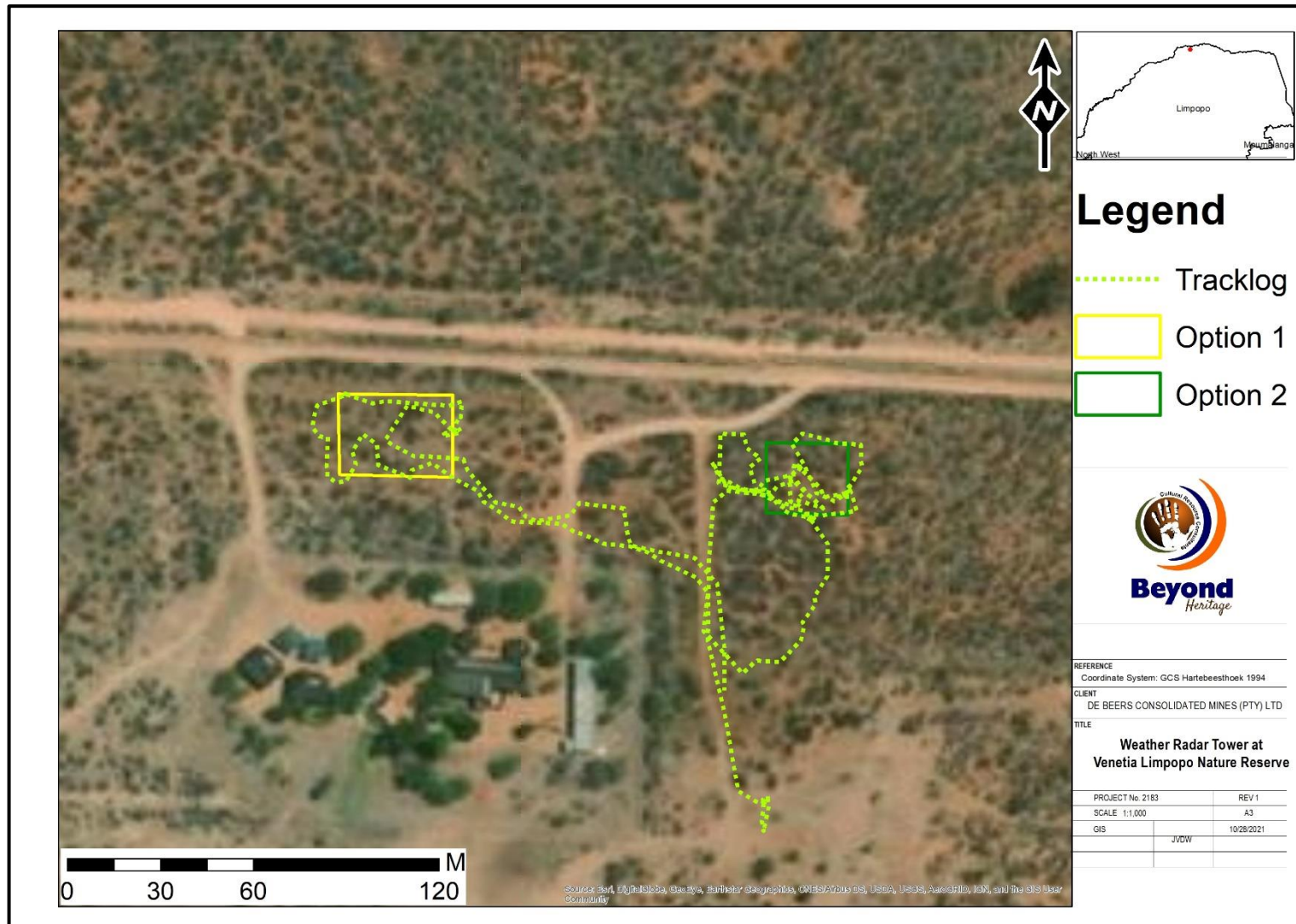


Figure 3.1: Tracklog of the survey in green.

### 3.5 Impact Assessment Methodology

The following impact assessment methodology was provided by the AVDE:

The significance of the identified impacts will be determined using an accepted methodology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998 as provided by the EAP. As with all impact methodologies, the impact is defined in a semi-quantitative way and will be assessed according to methodology prescribed in the following section.

#### Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating	Scale	Description / criteria
<b>MAGNITUDE of negative impact</b> (at the indicated spatial scale)	10	Very high	Bio-physical and/or social functions and/or processes might be <i>severely</i> altered.
	8	High	Bio-physical and/or social functions and/or processes might be <i>considerably</i> altered.
	6	Medium	Bio-physical and/or social functions and/or processes might be <i>notably</i> altered.
	4	Low	Bio-physical and/or social functions and/or processes might be <i>slightly</i> altered.
	2	Very low	Bio-physical and/or social functions and/or processes might be <i>negligibly</i> altered.
	0	Zero	Bio-physical and/or social functions and/or processes will remain <i>unaltered</i> .
<b>MAGNITUDE of POSITIVE IMPACT</b> (at the indicated spatial scale)	10	Very high	Positive: Bio-physical and/or social functions and/or processes might be <i>substantially</i> enhanced.
	8	High	<b>Positive:</b> Bio-physical and/or social functions and/or processes might be <i>considerably</i> enhanced.
	6	Medium	<b>Positive:</b> Bio-physical and/or social functions and/or processes might be <i>notably</i> enhanced.
	4	Low	<b>Positive:</b> Bio-physical and/or social functions and/or processes might be <i>slightly</i> enhanced.
	2	Very low	<b>Positive:</b> Bio-physical and/or social functions and/or processes might be <i>negligibly</i> enhanced.
	0	Zero	<b>Positive:</b> Bio-physical and/or social functions and/or processes will remain <i>unaltered</i> .
<b>DURATION</b>	5	Permanent	<b>Impact in perpetuity. –</b>
	4	Long term	Impact ceases after operational phase/life of the activity > 60 years.
	3	Medium term	Impact might occur during the operational phase/life of the activity – 60 years.
	2	Short term	Impact might occur during the construction phase - < 3 years.
	1	Immediate	<b>Instant impact.</b>
<b>EXTENT</b> (or spatial scale/influence of impact)	5	International	<b>Beyond the National boundaries.</b>
	4	National	Beyond provincial boundaries, but within National boundaries.
	3	Regional	Beyond 5 km of the Impact Area and within the provincial boundaries.
	2	Local	Within a 5 km radius of the Impact Area .

	1	Site-specific	On site or within 100 meters of the site boundaries.
	0	None	Zero extent.
IRREPLACEABLE loss of resources	5	Definite	Definite loss of irreplaceable resources.
	4	High potential	High potential for loss of irreplaceable resources.
	3	Moderate potential	Moderate potential for loss of irreplaceable resources.
	2	Low potential	Low potential for loss of irreplaceable resources.
	1	Very low potential	Very low potential for loss of irreplaceable resources.
	0	None	Zero potential.
REVERSIBILITY of impact	5	Irreversible	Impact <b>cannot</b> be reversed.
	4	Low irreversibility	Low potential that impact might be reversed.
	3	Moderate reversibility	Moderate potential that impact might be reversed.
	2	High reversibility	High potential that impact might be reversed.
	1	Reversible	Impact <b>will be</b> reversible.
	0	No impact	No impact.
PROBABILITY (of occurrence)	5	Definite	>95% chance of the potential impact occurring.
	4	High probability	75% - 95% chance of the potential impact occurring.
	3	Medium probability	25% - 75% chance of the potential impact occurring
	2	Low probability	5% - 25% chance of the potential impact occurring.
	1	Improbable	<5% chance of the potential impact occurring.
	0	No probability	Zero probability.
Evaluation Component	Rating scale and description / criteria		
CUMULATIVE impacts	<p><b>High:</b> The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.</p> <p><b>Medium:</b> The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern.</p> <p><b>Low:</b> The activity is localised and might have a negligible cumulative impact.</p> <p><b>None:</b> No cumulative impact on the environment.</p>		

Once the Environmental Risk Ratings have been evaluated for each potential environmental impact, the Significance Score of each potential environmental impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential environmental impact as per Table 8.2 below. The Environmental Significance rating process is completed for all identified potential environmental impacts both before and after implementation of the recommended mitigation measures.

#### Scale used for the evaluation of the Environmental Significance Ratings

Significance Score	Environmental Significance	Description / criteria
--------------------	----------------------------	------------------------

125 – 150	<b>Very high (VH)</b>	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	<b>High (H)</b>	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	<b>Medium-high (MH)</b>	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked at.
40 – 74	<b>Medium (M)</b>	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	<b>Low (L)</b>	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	<b>Positive impact (+)</b>	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

### 3.6 Limitations and Constraints of the study

The authors acknowledge that the brief literature review is not exhaustive on 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. Similarly, the depth of cultural deposits and the extent of heritage sites cannot be accurately determined due its subsurface nature. This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys.

## 4 Description of Socio-Economic Environment

According to StatsSA the Musina Municipality is a multi-racial municipality, due to the influence of the mining industry and the Beit bridge border gate. Only 50% of the population in the municipality speaks Tshivenda as their first language, followed by 8,8% who speak Sesotho, which is unusual in this area. The population in the municipality is dominated by people of aged 15–36. There are over 20 042 household in Musina Municipality with an average of 3,1 persons per household. The majority of households live in a house or brick/concrete block structures at 78%, followed by those who lives in traditional dwelling at 15,4 %. The majority of households in the district have access to piped water at 93%.

## 5 Results of Public Consultation and Stakeholder Engagement:

### 5.1.1 Stakeholder Identification

No stakeholder engagement was conducted as part of this HIA.

## 6 Literature / Background Study:

### 6.1 Literature Review (SAHRIS)

The study area is located south of the World Heritage Site of Mapungubwe. Although the site is located outside of the World Heritage Site it is within the buffer zone and a vast amount of research is available on the general area. In addition, the University of the Witwatersrand was commissioned to conduct research on the Iron Age sites in the area (Huffman 2007 and 2008) and were consulted for this report. Three sites are on record adjacent to the study area (Figure 6.1). Site 175 date to the historical period and although no information is given for Sites 359 & 360 these are probably associated with Farming Communities/ Iron Age Settlements. For the purposes of this report the term Iron Age will be used, in line with the referenced sources. The following CRM assessments were consulted for this report:

Table 5. CRM Assessments consulted for this study.

Author	Year	Project	Findings
Gaigher, S.	2000	Preliminary Archaeological impact assessment of two agricultural fields on the farm Alyth 118MS	Stone Age, Iron Age and burial sites.
Huffman, T.	2003	Archaeological assessment of tourism developments in the Mapungubwe Cultural Landscape.	Stone Age and Iron Age sites
Munyai, R & Roodt, F.	2007	Heritage Impact Assessment – an archaeological investigation of a proposed irrigation dam at farm Overvlakte 125 MS, Musina Municipality, Vhembe district,	No sites



Huffman, TN	2007	The Origins Of Mapungubwe Project Project Summary 2003-2007	Iron Age research
Huffman, TN	2008	Origins Of Mapungubwe Project Progress Report 2008 A progress report prepared for De Beers, the NRF, SAHRA and SANParks	Iron age research
Roodt, F.	2009	Heritage Impact Assessment Report Proposed Vele Colliery Weipe Vhembe District Municipality: Limpopo	Stone Age, Iron Age, Grave Sites and Historical structures.
Huffman, T.N. & Van der Walt, J.	2011	Heritage Survey For The Limpopo Project. A Pre-feasibility field study prepared for Anglo American Thermal Coal, Geological Services	2 ESA, 13 MSA, 6 LSA, 144 Iron Age, 1 Historic house.
Pikarayi, I. Chirikure, S. Manyanga, M Mothulatshipi, S.	2012	Heritage Impact Assessment Report and Management Plan Relating to the Establishment of the Vele Colliery near Mapungubwe World Heritage Site, Musina, Limpopo Province: South Africa	36 Sites ranging from Stone Age artefacts to significant Iron Age and Burial sites.
Steggman, L. & Roodt, F.	2018	Phase 1 Heritage Resources Scoping Report Proposed Expansion of the Existing Dam on Rem Portion of the Farm Overvlakte 125 MS, Musina Local Municipality, Vhembe District, Limpopo Province	Iron Age grain bin and ceramic site. The study also indicated that for the paleontological component there is a very high likelihood of the occurrence of fossils, typically palaeoflora of <i>Glossopteris</i> , <i>Dadoxylon</i> and <i>Vertebraria</i> within the lower Karoo strata
Van der Walt, J.	2020	Heritage Impact Assessment Skutwater 115 MS, Limpopo Province.	Several Iron Age/ Farming Community sites were recorded.
Van der Walt, J.	2021	Heritage Impact Assessment for the proposed VLNR Lodge, Limpopo Province	Iron and Stone Age sites.

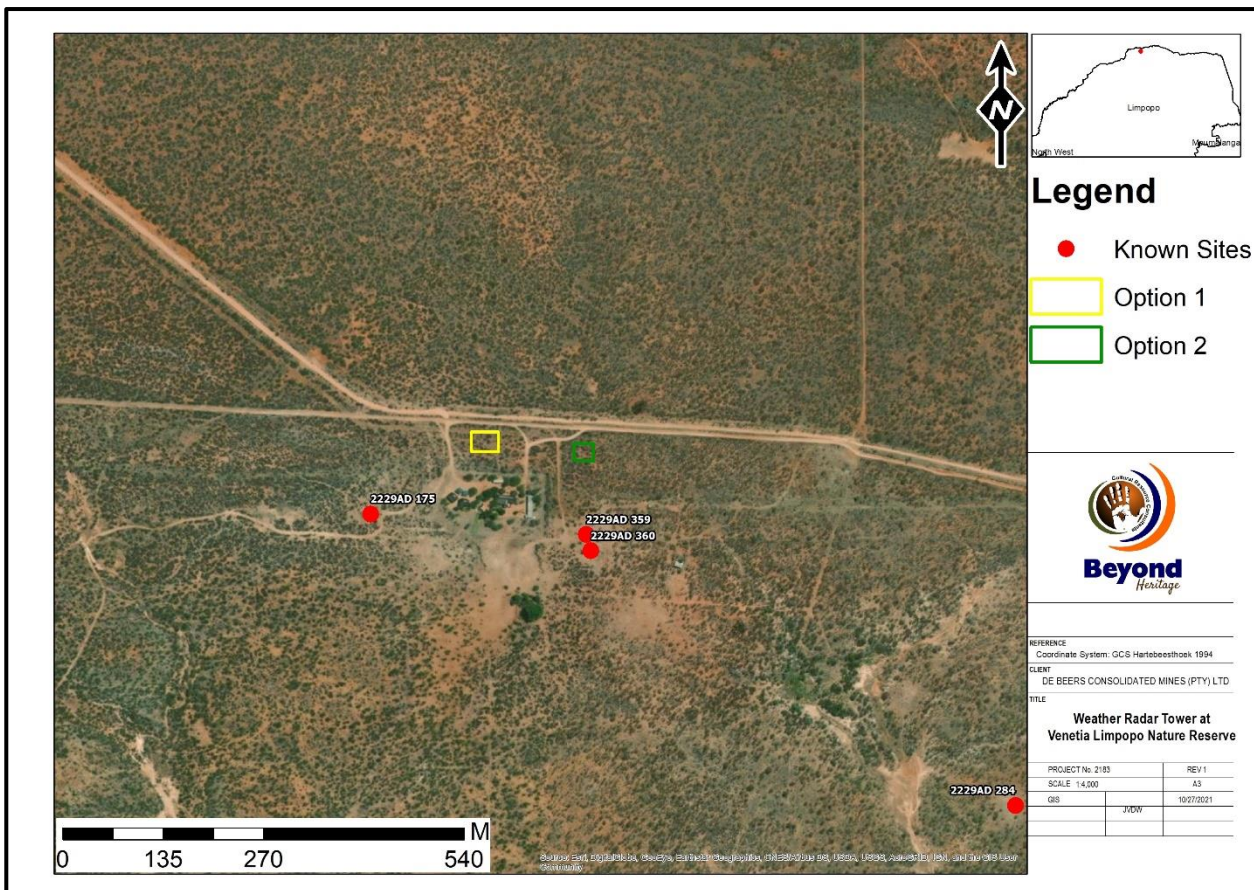


Figure 6.1. Known sites in relation to the study area.

### 6.1.1 Graves and Burial sites

No known grave sites are indicated in the study area.

## 6.2 Background to the general area

### 6.2.1 Archaeology of the area

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age (LSA), the Middle Stone Age (MSA) and the Earlier Stone Age (ESA). Each of these phases contain sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. The three main phases can be divided as follows;

- \* Later Stone Age; associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago
- \* Middle Stone Age; associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.
- \* Earlier Stone Age; associated with early Homo groups such as Homo habilis and Homo erectus. 400 000- > 2 million years ago.

The larger geographical area was inhabited since the ESA and was subjected to intensive research (Kuman *et al* 2000). Isolated hand axes have been found on Venetia, but they have little value. The most important site is Kudu Koppie on the farm Samaria. It is one of the few sites in the country with late ESA stratified under the MSA (Pollarolo & Kuman 2009). Other ESA artefacts have eroded from the edge of the escarpment facing the Limpopo River. These ESA (and MSA) artefacts rest on top of a calcrete layer, or on the sandstone bedrock. The artefacts include numerous cores made from quartzite cobbles found at the

foot of the escarpment. These cobbles in turn are eroding out of decalcified alluvial gravels deposited by the Limpopo River (Huffman & van der Walt 2011).

MSA artefacts are common throughout the Limpopo Valley, but unless they occur in undisturbed deposits, they have little significance. Generally, a few MSA artefacts, such as cores, can occur anywhere across the plateau, while many more lay scattered along the escarpments because of deflation and erosion (Le Baron *et al.* 2010). The homogenous distribution suggests resources were also evenly distributed across the plateau. It is not possible to tell, however, if the scatter is the result of short intensive use or repeated use over a longer period. The sand mantel above the calcrete and sandstone varies from 0.1 to 5.6m in depth. It is largely derived from the Clarens Formation that forms the local sandstone bedrock. The mantel itself dates to the Holocene, in this case from about 14 000 to 25 000 years ago (Kuman *et al.* 2005). As a rule, only LSA artefacts occur in the sand. In terms of the MSA evidence of bipolar flaking that is associated with the MSA Pietersburg Industry (Mason 1962) occurs at the earlier Limpopo site, Kudu Koppie (Sumner 2013).

During the LSA, people started to occupy sites on a recurring basis often in rock shelters and caves and often left panels of rock art in these shelters a rock art survey on both sides of the Limpopo Sashi confluence area identified close to 150 rock art sites (Eastwood and Cnoops 1999). Work on both open sites and rock shelters indicate that LSA people lived in the area from about 11 000 years ago (Van Doornum 2008). Occupation intensified, however, when farmers moved into the valley. One important shelter on the farm Little Muck suggests that Iron Age farmers took over some rock shelters from foragers for their own ritual use (Hall & Smith 2000).

### 6.2.1.1 The Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. The Iron Age is divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

Phases within each period are marked by different ceramic *facies* (Figure 6.2). A short summary of occupation in the Limpopo valley will now be discussed.

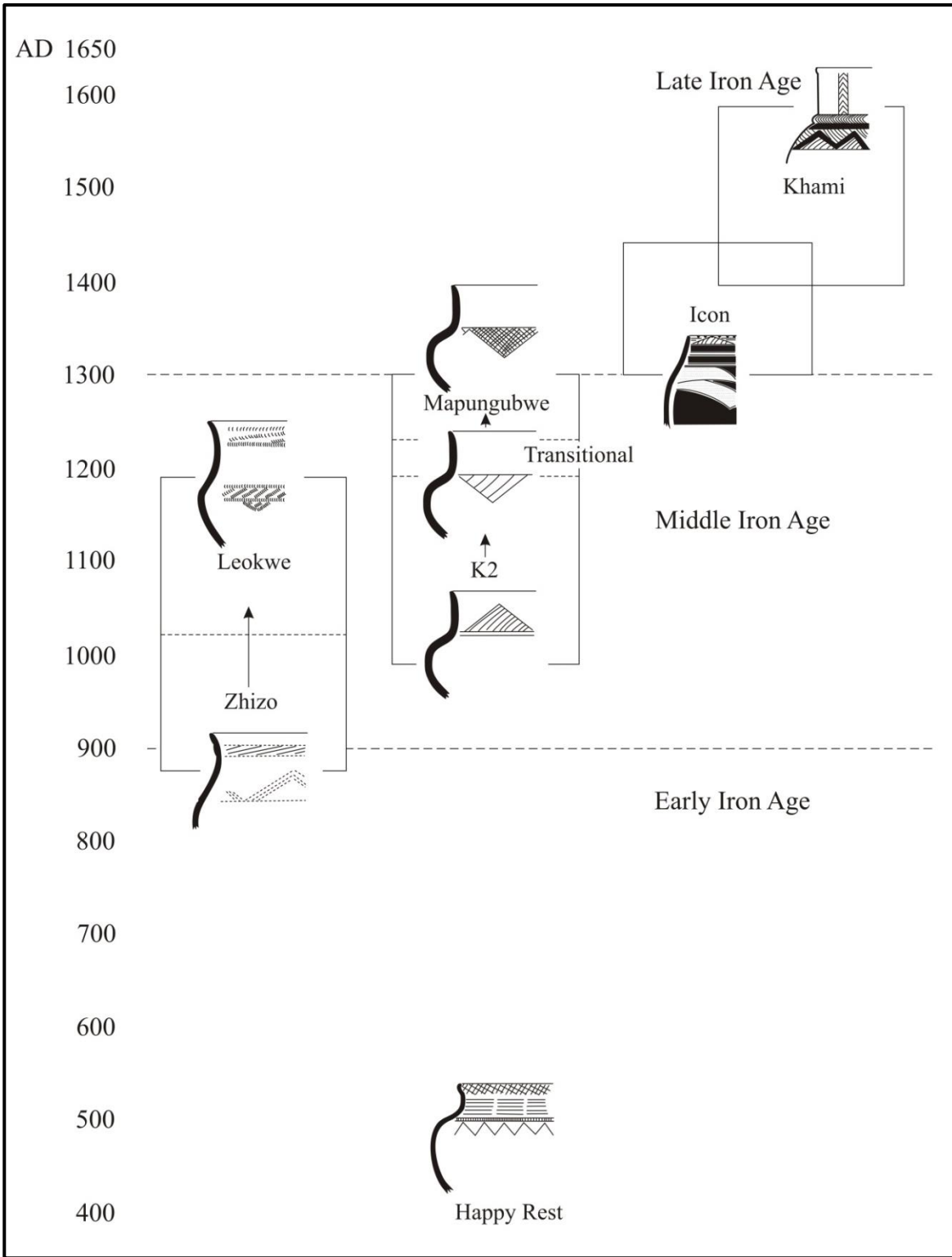


Figure 6.2: Iron Age ceramic facies for the Mapungubwe region (Adapted from Huffman 2009b).

### Early Iron Age

Between AD 500 and 700, agro-pastoralists joined the hunter gatherers in the region. This was marked by ceramics belonging to the *Happy Rest* and *Mzonjani* facies (Figure 6.2). These societies were patrilineal (cf. Hammond-Tooke 1993) and spoke an Eastern Bantu language (Huffman & Herbert 1994/1995).

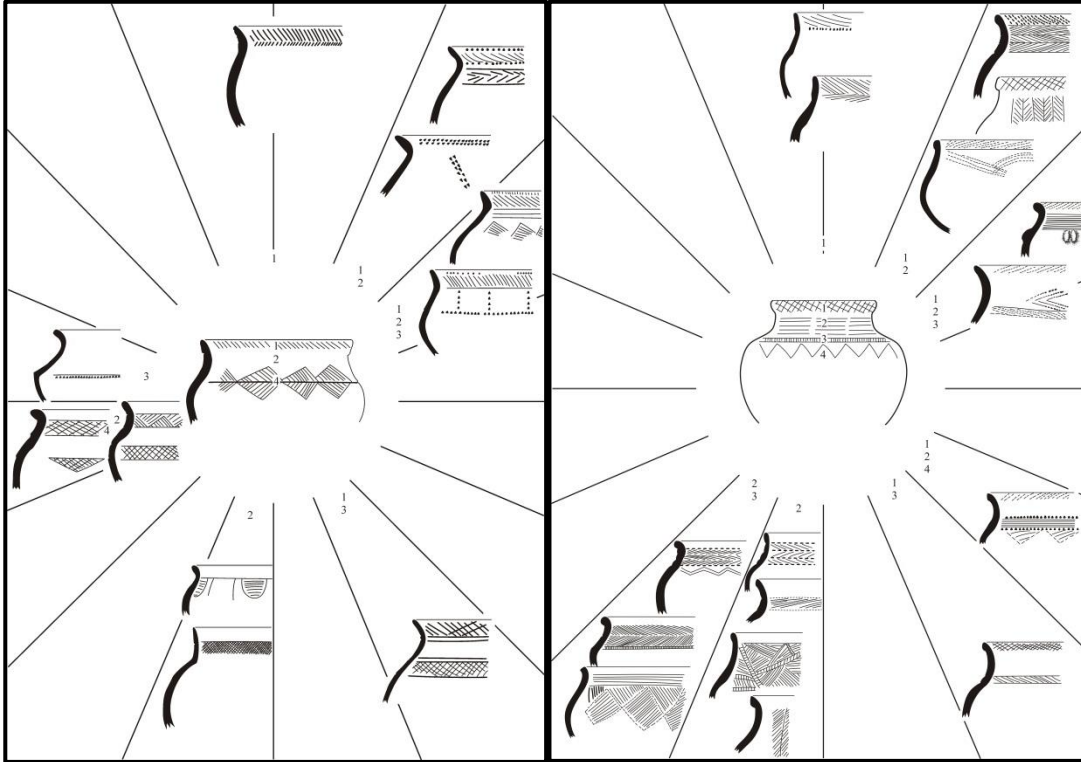


Figure 6.3: Definition of *Mzonjani* ceramics on the left and *Happy Rest* ceramics on the right (Adapted from Huffman 2007a).

After this initial intrusion, agro-pastoralists seem to have abandoned the area until AD 900 because of adverse climatic conditions (Huffman 1996a). From AD 900 to 1000, *Zhizo* pottery (Figure 6.4) marks the second phase of occupation. *Zhizo* ceramics belong to the Nkope Branch of the Urewe Tradition (or Central Stream) (Figure 6.5). Initially it was thought that *Zhizo* people moved into the area to practise agriculture (Huffman 1996a). However, isotopic analysis shows that the climate was no better than today (Smith 2005). *Zhizo* farmers would therefore have found farming difficult, and some other factors must have lured them to the area. Presumably, they moved into the valley to take advantage of the East Coast trade (Huffman 2000; Smith 2005), where the Limpopo River acted as a route into the interior. The location of settlements (most are located well away from the rich agricultural soils around the floodplain because elephants would have destroyed the crops) as well as ivory chippings and exotic goods at Schroda (Hanisch 1980) suggest that trade was the main attraction. Ivory, like gold, was a lucrative export commodity, and historical accounts record large amounts of ivory reaching Sofala from the interior (Kusimba 1999). In addition, the wide distribution of *Zhizo*-period glass beads (Wood 2005) suggests that *Zhizo* people traded them for grain with more successful farmers outside the valley.

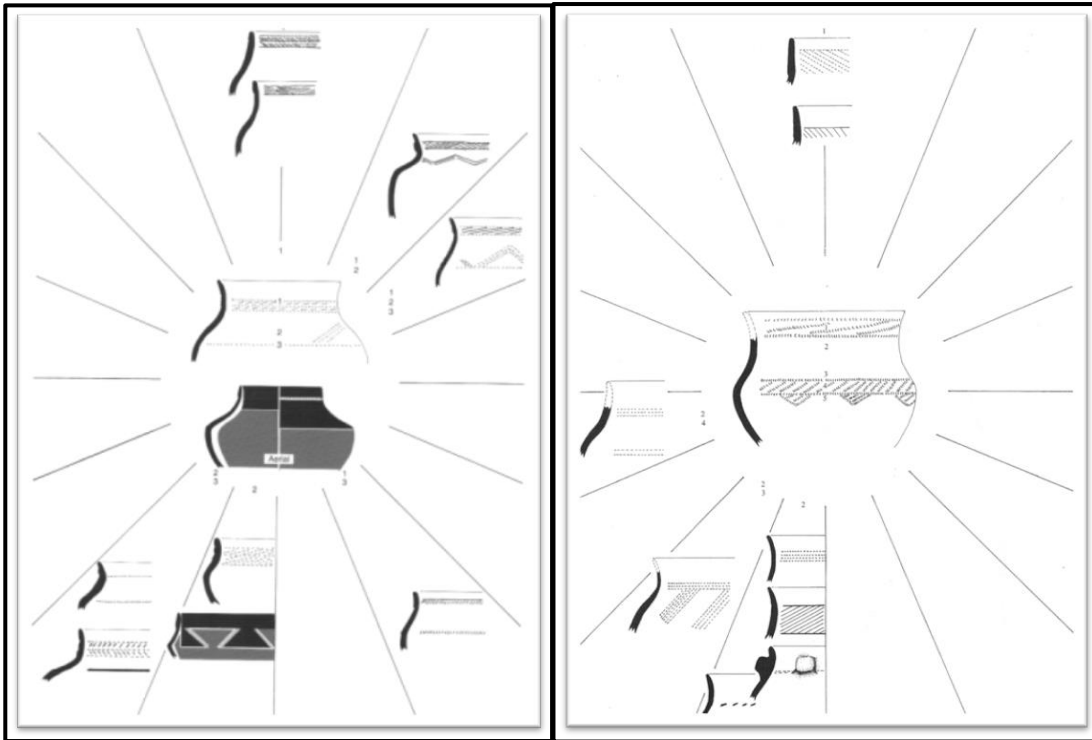


Figure 6.4: Definition of *Zhizo* ceramics on the left and *Leokwe* ceramics on the right (Adapted from Huffman 2007a).

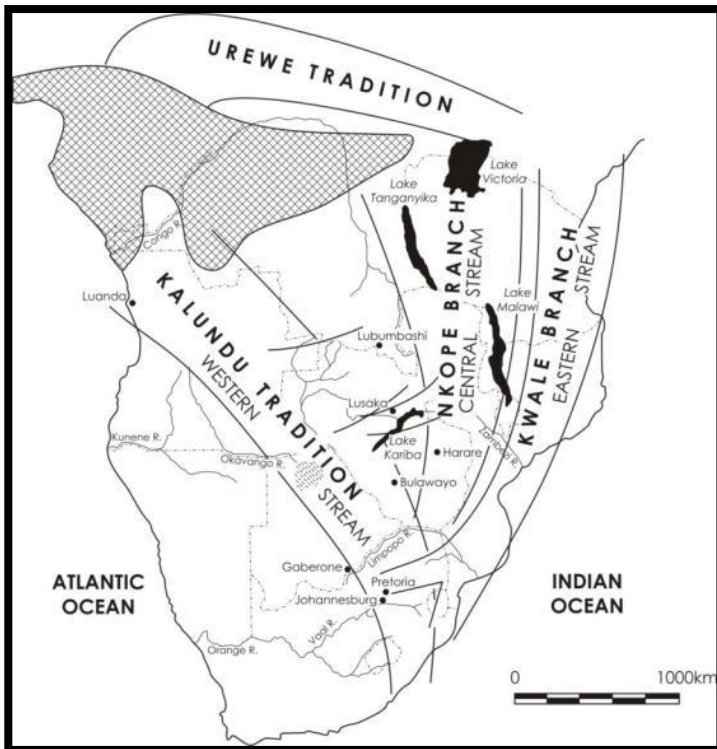


Figure 6.5: Map of southern Africa indicating migration routes of different Iron Age Traditions (Adapted from Huffman 2007a).

### **Middle Iron Age**

After approximately 100 years, around AD 1010, the Zhizo political control over the area and coastal trade was terminated by the arrival of new agro-pastoralists that archaeologists refer to as Leopard's Kopje. Leopard's Kopje ceramics are derived from the *Doornkop* facies (formerly Lydenburg) to the south (Huffman 2007a), an Early Iron Age phase of the Kalundu Tradition (Figure 6.5).

After replacing the Zhizo chiefdom, Leopard's Kopje people established their capital at K2, located at the base of Bambandyanalo Hill (Fouché 1937; Gardner 1963). K2 was occupied between AD 1000 and 1220 (Vogel 2000). This period was marked by higher rainfall (Smith 2005), resulting in an emphasis on floodplain agriculture (Huffman 2000; Smith 2005) allowing for population growth.

Changes in world view are marked by a shift away from the Central Cattle Pattern (CCP) to the elite Zimbabwe Pattern (ZP). The new ideology of sacred leadership was materialised when Leopard's Kopje people abandoned K2 for Mapungubwe, less than a kilometre away.

During this period (AD 1200 to 1250) of transition the ceramic style also changed (Figure 6.6). These transitional ceramic facies are now termed *Transitional K2*, or *TK2*.

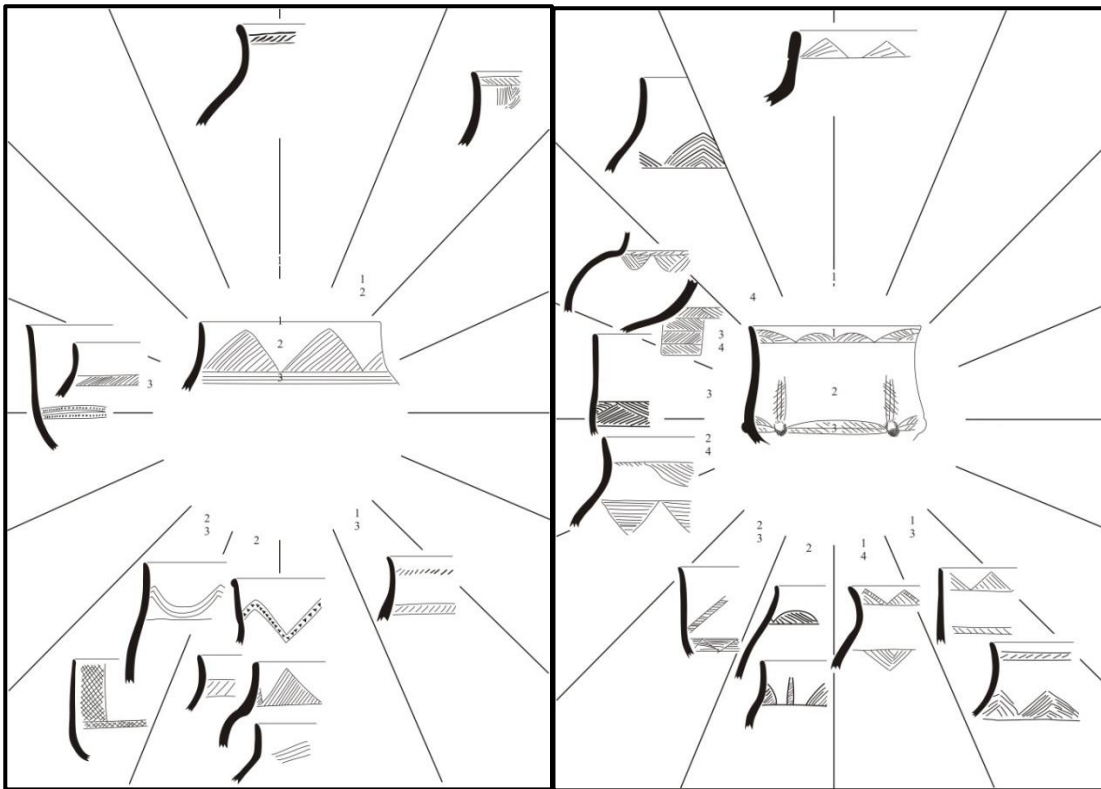


Figure 6.6: Definition of *K2* ceramics on the left and *TK2* ceramics on the right (Adapted from Huffman 2007a) Transitional occupation was equally divided between floodplain and escarpment where there is a clear distinction between cattle and agriculturally orientated settlements. By about AD 1250, the *TK2* facies changed into classic Mapungubwe ceramics.

### 6.3 Historical Information

In 1903 the copper deposits in the Musina area were investigated by Colonel John P Grenfell. He also established the Messina (Transvaal) Development Company Limited to exploit the copper deposits. The town of Messina now referred to as Musina was founded in 1904 on the farm Berkenrode, because of the exploitation of the copper deposits. It was proclaimed as town in 1957 (Hammerbeck & Schoeman 1976).



### 6.3.1 Anglo-Boer War

No sites dating to the Anglo-Boer War are known close to the study area.

### 7.3.3. Cultural Landscape

The World Heritage site of Mapungubwe is located approximately 10km to the north of the development and the proposed Weather Tower is located within the buffer zone (Figure 6.7). The Mapungubwe Cultural Landscape is comprised of:

- Remains of palaces – (Mapungubwe period);
- Archaeological remains testifying to Mapungubwe's growth 900-1200 AD (Zhizo, Leopard's Kopje);
- Remains of early settlement: Stone Age & Iron Age & rock art;
- 'Natural' landscape surrounding the built remains;
- Intangible heritage: Mapungubwe Hill associated with sacredness, beliefs, customs and traditions of local communities;
- Living heritage: continuing traditions and associations such as rain making, and participation by local communities in reburial ceremonies;
- Landscape sharing and interaction between farmers and hunter-gatherers.

The following is a direct extract from the VLNR Lodge HIA by Van der Walt (2020) - *Diamond-bearing gravels were discovered as early as 1903 close to the Limpopo River, 35km north-east of the present mine. De Beers Group began a sampling programme in 1969 to locate the source of these alluvial diamonds. Viable kimberlite pipes were discovered in 1980. Work on the mine started in 1990, Venetia mine opened in 1992 and full production was achieved in 1993.*

*The Vhembe/Dongola National Park was declared on 09 April 1998 (GN 490 in GG 18814). The Mapungubwe Cultural Landscape (MCL) was gazetted as a National heritage site by the South African Heritage Resources Agency (SAHRA) in December 2001. The MCL was inscribed on the United Nations Education, Scientific and Cultural Organization's (UNESCO) World Heritage List in 2003. In Government Notice No. 71 of 30 January 2009 (GN 31832) the then Minister Marthinus van Schalkwyk declared the MCL as a World Heritage Site in terms of the World Heritage Convention Act (Act 49 of 1999), and delegated specified powers of management to SANParks. The park name was changed to Mapungubwe National Park (MPNP) on 30 July 2004 (GN 900 in GG 26602). The park also forms the core of the Vhembe Biosphere Reserve. At international level, close liaison is required with the UNESCO World Heritage Centre and the Greater Mapungubwe Transfrontier Conservation Area (GMTFCA) involving Botswana, Zimbabwe and South Africa. The core area of the World heritage site comprises 28,168.66 ha. Various privately owned properties make up the buffer zone, which, added to the core, comprises some 100,000 ha.*

*Venetia Mine is located approximately 22km south of the Mapungubwe National Park. In 2014 the Unesco committee approved a new boundary and buffer zone for Mapungubwe in response to the past concerns regarding the impacts of mining on the site. The Venetia Mining Rights Area have been removed from the 2009 proclaimed boundary as per the 2014 revised buffer zone. Venetia Mine is surrounded by the Venetia Limpopo Nature Reserve (VLNR) that was established in 1991. The gazetted buffer zone surrounding the core of the Mapungubwe Cultural Landscape World Heritage Site (MCLWHS) extended to approximately 20 km from the core at the Mapungubwe Hill.*

Since the listing of Mapungubwe as a World Heritage Site in 2003, the management authorities have always ensured co-existence between responsible diamond mining at Venetia, located on the periphery of the buffer zone, but with operational assets such as boreholes, pump stations and water storage dam located within the core of the WHS. The large section of the buffer zone falls in the De Beers VLNR whose objectives include maintaining the integrity and authenticity of the cultural landscape through continuous monitoring and impact assessments in the VLNR and areas affected by the Venetia Mine water provision assets. De Beers has had a long-term role in managing mining and sustainable conservation in the region. The VLNR, which surrounds the Venetia Mine, has created a viable buffer between the mined area and the biophysical and cultural resources conservation area. The reserve, which now forms part of the MCLWHS buffer zone, has always added extra protection to cultural heritage sites around the core of the listed property.

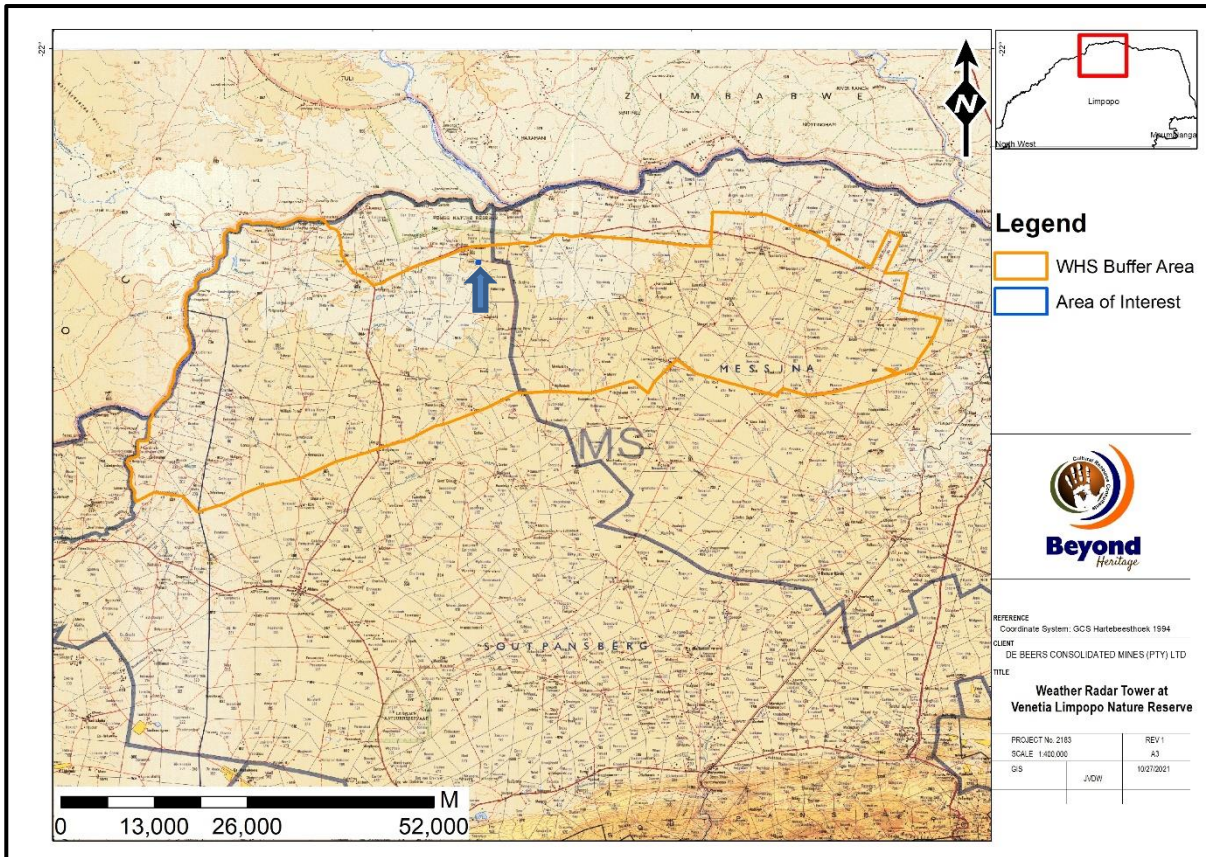


Figure 6.7. The proposed Project in relation to the Mapungubwe World Heritage Site buffer zone.

#### 6.4 Site Significance and Field Rating

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.
- 

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 (Table 6). The recommendations for each site should be read in conjunction with section 10 of this report.

Table 6. Heritage significance and field ratings

<b>FIELD RATING</b>	<b>GRADE</b>	<b>SIGNIFICANCE</b>	<b>RECOMMENDED MITIGATION</b>
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

## 7 Description of the Physical Environment

The study area is situated within the Venetia Limpopo Nature Reserve, the Mapungubwe Cultural Landscape and an international conservation area, i.e. the Vhembe Biosphere Reserve. Land use in the surrounding area is characterised by natural bushveld within nature reserves and national parks, where limited disturbance has occurred. Disturbance of the rural character of the area is in the form of the research camp directly south of the study area, existing power lines, gravel roads and fences that have altered the landscape character somewhat. The study area is relatively flat and surrounded by mountainous terrain in the greater area, dominated by bushveld vegetation within the Savanna Biome and Mopane Bioregion (Mucina & Rutherford 2018). General site conditions are indicated in Figure 7.1 to 7.4.



Figure 7.1. Existing Powerline infrastructure viewed from Option 1.



Figure 7.2. Existing powerline viewed from Option 2.



Figure 7.3. General site conditions



Figure 7.4. Existing powerlines in the study area.

## 8 Findings of the Survey

### 8.1 Cultural Heritage

The environment in which the proposed tower options are located is used as a game reserve with limited human interference. Although next to the tower options disturbances relating to fences, gravel roads, existing power lines and a research camp slightly changed the character of the area. Archaeological surveys by the University of the Witwatersrand covered the area and recorded three sites to the south of the study area, during the current assessment two additional observation points were recorded (Figure 8.1). These observations do not constitute archaeological sites but find spots consisting of isolated MSA artefacts. These artefacts are found where the shallow sand cover is eroded exposing the calcrete sub strata. Finds included a radial MSA core and a few miscellaneous flakes considered to form part of the background scatter (Orton 2016) on a variety of raw material (e.g., quartzite and hornfels). The observation points were recorded as waypoints 206 and 207 located at 22° 15' 59.7529" S, 29° 19' 53.7815" E and 22° 15' 58.9753" S, 29° 19' 50.0447" E. These isolated artefacts are of low significance with a field rating of Generally Protected C (GP.C). Observation points are spatially illustrated in Figure 8.1 and general site conditions indicated in Figure 8.2 to 8.5.

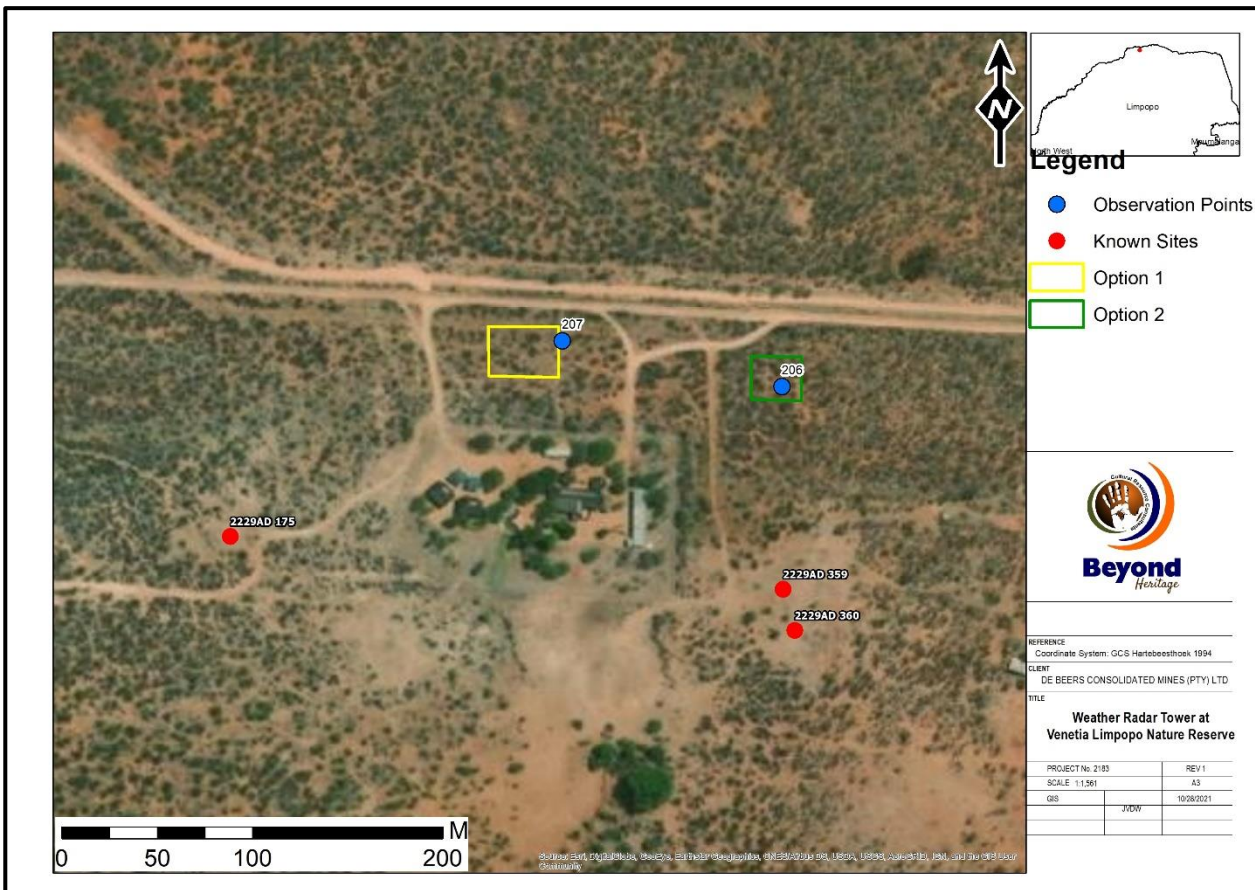


Figure 8.1. Recorded features in relation to the project.



Figure 8.2. Study area with lodge in the background.



Figure 8.3. Calcrete outcrops



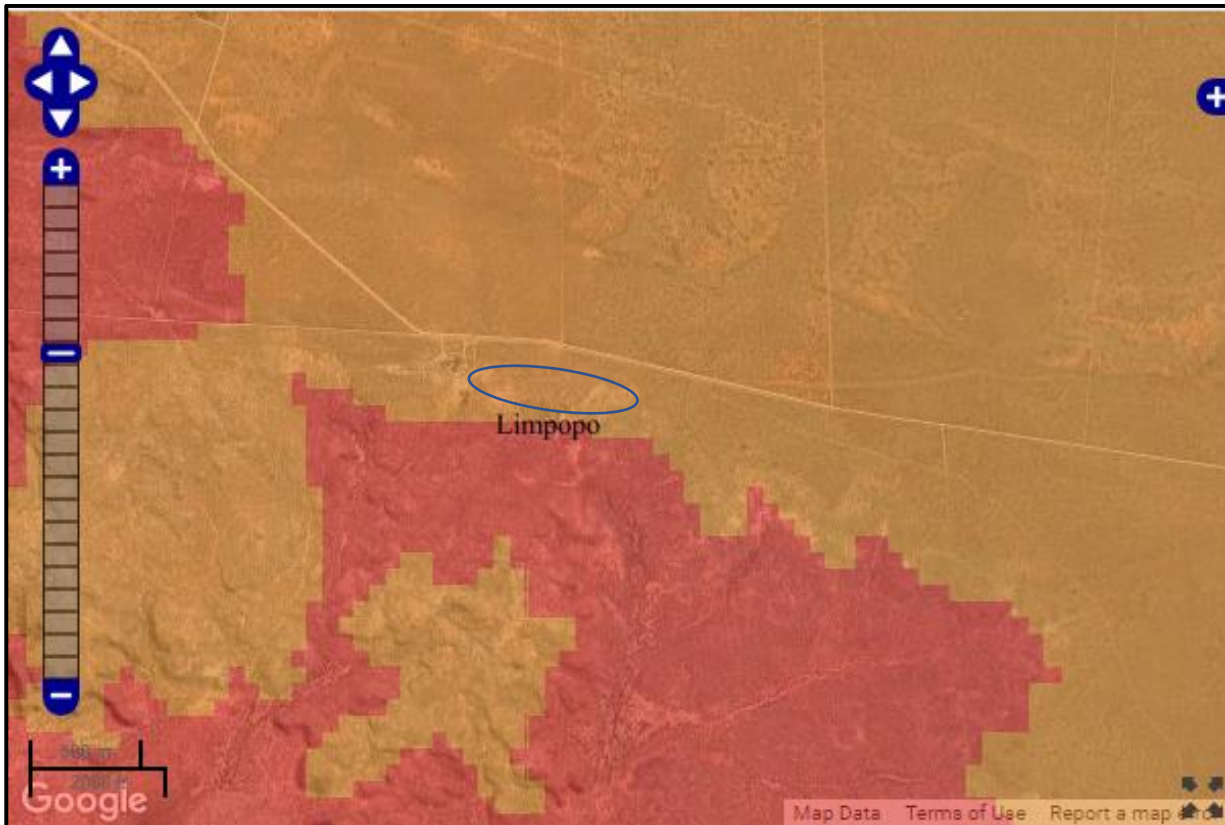
Figure 8.4. MSA artefacts recorded in Option 1.



Figure 8.5. Dorsal and ventral views of MSA artefacts in Option 2.

## 8.2 Paleontological Heritage

Based on the SAHRA Paleontological map the study area is of high sensitivity (Figure 8.6) and an independent study was conducted by Prof Marion Bamford for this aspect and found it is extremely unlikely that any fossils would be preserved in the very small foot print of the tower in the aeolian sands of the Tshipise Member (Clarens Formation, Stormberg Group, Karoo Supergroup) or in the overlying soils of the Quaternary. There is a very small chance that fossils may occur 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 8.6. Paleontological sensitivity of the approximate study area as indicated on the SAHRA Palaeontological sensitivity map.



### 8.3 Visual Impact Assessment

In the SAHRA Response to Notification of Development comments they requested a Visual Impact Assessment to be conducted for the Weather Tower because of its location close to the Mapungubwe National Park. The proposed Weather Tower may potentially have a visual impact to the Mapungubwe road (R572) and Mapungubwe gate and an independent assessment was conducted (Erwee 2021).

The assessment found that the proposed project will have a moderate visual impact during all phases, prior to mitigation measures being implemented. With the implementation of mitigation measures as outlined in the VIA, the visual impact on the receiving environment may be lowered to low significance visual impacts. Based on the outcome of the visual assessment the author recommend that the proposed weather radar tower may be considered for authorisation with the knowledge that the significance of risk to the receiving environment is limited.

## 9 Potential Impact

No heritage sites of significance are located within the impact area and therefore no adverse impact to heritage resources is expected. Impacts of the project on heritage resources is expected to be low during all phases of the development (Table 8). Isolated and out of context artefacts dating to the Stone Age show evidence of landscape use of the study area in antiquity but no surface indicators of any features were noted. Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a chance find procedure and monitoring of the study area. Mitigation measures as recommended in this report should be implemented during all phases of the project.

### 9.1.1 Pre-Construction phase

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources.

### 9.1.2 Construction Phase

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. Potential impacts include destruction or partial destruction of non-renewable heritage resources.

### 9.1.3 Operation Phase

No impacts are expected during this phase.

### 9.1.4 Impact Assessment for the Project

The proposed project will not impact on any of the heritage attributes of the Mapungubwe WH property. Although the development area is in proximity to cultural heritage sites of medium significance (Figure 9-1) the impacts on these sites can be mitigated to an acceptable level. Following the ICOMOS Impact Assessment rating for WHS the impact of the proposed development on the WH property with the implementation of the mitigation measures as recommended in this report is neutral/ slight (Table 7).

**Table 7.** ICOMOS System for assessing/ evaluating Impact.

VALUE OF HERITAGE ASSET	SCALE & SEVERITY OF CHANGE/IMPACT				
	Neutral	Slight	Moderate/ Large	Large/ Very Large	Very Large
For WH properties Very High – attributes which Convey OUV	SIGNIFICANCE OF EFFECT OR OVERALL IMPACT (EITHER ADVERSE OR BENEFICIAL)				
	Neutral	Slight	Moderate/ Large	Large/ Very Large	Very Large
FOR OTHER HERITAGE ASSETS OR ATTRIBUTES	SIGNIFICANCE OF IMPACT (EITHER ADVERSE OR BENEFICIAL)				
Very High	Neutral	Slight	Moderate/ Large	Large/ Very Large	Very Large
High	Neutral	Slight	Moderate/ Slight	Moderate/ Large	Large/ Very Large
Medium	Neutral	<b>Neutral/Slight</b> VLNR Weather Tower	Slight	Moderate	Moderate/ Large
Low	Neutral	Neutral/ Slight	Neutral/ Slight	Slight	Slight/ Moderate
Negligible	Neutral	Neutral	Neutral/ Slight	Neutral/ Slight	Slight

The significance of the identified impacts is determined by using the accepted methodology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998 as provided by the EAP.

Table 8. Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								Cumulative	Status	RECOMMENDED MEASURES/ MITIGATION REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SP				M	D	S	I	R	P	TOTAL	SP
<b>Cultural Heritage Impact Assessment</b>																				
Heritage Resources	Construction of the VLNR Weather Tower	2	5	3	5	5	2	40	L	Low	Negative	<ul style="list-style-type: none"> <li>Implementation of a chance find procedure for the project (archaeology and palaeontology).</li> </ul>	2	5	3	0	0	2	20	L

## 10 Conclusion and recommendations

The proposed weather radar tower will be between 20 – 40m in height, with a footprint area of approximately 900 m<sup>2</sup> (30 x 30 m). An existing farm road will be used to gain access to the proposed site, and an existing powerline will be utilised for electricity supply. The HIA included a palaeontological assessment (Bamford 2022) since the area is of high palaeontological sensitivity (SAHRIS) and due to its location close to the Mapungubwe National Park, the proposed Weather Tower may potentially have a visual impact assessed by Erwee (2021).

The environment in which the proposed tower options are located is used as a game reserve with limited human interference. Although next to the tower options disturbances relating to fences, gravel roads, existing power lines and a research camp slightly changed the character of the area. Archaeological surveys by the University of the Witwatersrand covered the area and recorded three sites to the south of the study area and during the current assessment two additional observation points were recorded (Figure 8.1). These observations do not constitute archaeological sites but find spots consisting of isolated MSA artefacts. These artefacts are found where the shallow sand cover is eroded exposing the calcrete sub strata. Finds included a radial MSA core and a few miscellaneous flakes considered to form part of the background scatter (Orton 2016) on a variety of raw material (e.g., quartzite and hornfels). These isolated artefacts are of low significance and do not warrant further mitigation.

The study area is indicated as of high paleontological sensitivity and an independent study was conducted by Prof Marion Bamford. The study concluded it is extremely unlikely that any fossils would be preserved in the very small footprint of the tower in the aeolian sands of the Tshipise Member (Clarens Formation, Stormberg Group, Karoo Supergroup) or in the overlying soils of the of the Quaternary. There is a very small chance that fossils may occur so a Fossil Chance Find Protocol should be added to the EMP. Based on the outcome of the visual assessment it is the specialist's opinion that the proposed weather radar tower may be considered for authorisation with the knowledge that the significance of risk to the receiving environment is limited.

The impact of the proposed project on heritage resources is low and it is recommended that the proposed project can commence on the condition that the following recommendations (Section 10.1) are implemented and based on approval from SAHRA:

### 10.1 Recommendations for condition of authorisation

The following recommendations apply, and the project may only proceed based on approval from SAHRA:

#### Recommendations:

- Implementation of a chance find procedure for the project for both the cultural heritage and paleontological components.

### 10.2 Chance Find Procedures

#### 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 therefore chance find procedures should be put in place for the project. A short summary of chance find procedures is discussed below.

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 Palaeontological resources

**Monitoring Programme for Palaeontology – to commence once the excavations and construction activities begin.**

- The following procedure is only required if fossils are seen on the surface and when excavations commence.
- When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, shells or trace fossils) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
- Photographs of similar fossil plants and vertebrates must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures.
- Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
- 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 excavations where feasible.
- 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.
- 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.
- 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 is considered to be low and the project can commence with the implementation of the recommendations made in the HIA, PIA and VIA. The safety 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 are the highest risk). This can cause delays during construction, as well as additional costs involved in mitigation and possible layout changes.

## 10.5 Monitoring Requirements

- *Induction training:* Responsible staff identified by the developer should attend a short course on heritage management and identification of heritage resources.
- *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 the initial soil removal and subsequent earthworks during construction. The ECO should monitor all such activities daily. If any heritage resources are found, the chance finds procedure must be followed as outlined above.

Monitoring requirements for the project is outlined in Table 10.

Table 9. Heritage monitoring required for the project.

Heritage Monitoring					
Aspect	Area	Responsible for monitoring and measuring	Frequency	Proactive or reactive measurement	Method
Clearing activities and construction	Entire project area	ECO	Weekly (Pre construction and construction phase)	Proactively	<ul style="list-style-type: none"> <li>• If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented:               <ol style="list-style-type: none"> <li>1. Cease all works immediately;</li> <li>2. Report incident to the Sustainability Manager;</li> <li>3. Contact an archaeologist/ palaeontologist to inspect the site;</li> <li>4. Report incident to the competent authority; and</li> <li>5. Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities.</li> </ol> </li> <li>• Only recommence operations once impacts have been mitigated.</li> </ul>

### 10.6 Management Measures for the project.

Table 10. Heritage Management Plan for the project

Area	Mitigation measures	Phase	Timeframe	Responsible party for implementation	Target	Performance indicators (monitoring tool)
<b>General project area</b>	Implement chance find procedures in case possible heritage finds are uncovered	Pre Construction and construction	Throughout the project	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	ECO Checklist/Report



### 10.7 Knowledge Gaps

This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.

Due to the subsurface nature of heritage resources, the possibility of discovery of heritage resources during the construction phase cannot be excluded. This limitation is successfully mitigated with the implementation of a chance find procedure.

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