HERITAGE IMPACT ASSESSMENT

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

FOR THE PROPOSED MAKGANYANE IRON ORE MINE - MINING RIGHT, NORTHERN CAPE PROVINCE

Type of development:

Mining Permit

Client:

Greenmined Environmental

Applicant:

Assmang (Pty) Ltd

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Project Reference:
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APPROVAL PAGE

Project Name	Makganyane Iron Ore Mine - Mining Right
Report Title	Heritage Impact Assessment for the proposed Makganyane Iron Ore Mine - Mining Right, Northern Cape Province
Authority Reference Number	TBC
Report Status	Draft Report
Applicant Name	Assmang (Pty) Ltd

Responsibility	Name	Qualifications and Certifications	Date
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Palaeontological Report	Prof Marion Bamford	PhD Palaeobotany	April 2025

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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
(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 - (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 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

Greenmined Environmental (Pty) Ltd has been appointed by Assmang (Pty) Ltd to conduct an Environmental Authorisation (EA) Application for the proposed mining opencast activities on 1 549.61 ha that extends over portion 2 (portion of portion 1), remainder portion of portion 1 and portion 3 of the farm Makganyene No 667 in the Tsantsabane Local Municipality, Northern Cape Province. Greenmined Environmental (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:

- Portions of the study area has been assessed in 2019 and 2021 by Van der Walt and finds included Stone Age scatters, historical exploration features and cemeteries;
- The 2019 survey also recorded four features consisting of two cemeteries, a stone cairn that could possibly mark a pre-colonial burial and features relating to previous exploration/ mining activities;
- During the 2025 survey, the previous features were verified and two additional heritage resources were identified including a grave and the Historical farmstead;
- Impacts to heritage resources of significance will be low as all graves and the Historical farmstead are situated outside of the impacted area;
- According to the South African Heritage Resource Authority (SAHRA) Paleontological sensitivity map the study area is of moderate palaeontological sensitivity and a Desktop study was conducted for this aspect. Bamford (2025) concluded that the proposed site lies on the non-fossiliferous Makganyene Formation (Postmasburg Group) diamictites and partly on moderately sensitive Gordonia Formation sands. No fossils have been reported from this area. 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.

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.

The table below provides information regarding the outcome of the Department of Forestry, Fisheries and the Environment (DFFE) Screening tool in terms of the Archaeological and Cultural Heritage as well as the Paleontological theme sensitivities associated with the proposed project and the specialist sensitivity verification.

ASPECT	DFFE SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	RELEVANT SECTION MOTIVATING VERIFICATION
Archaeological and Cultural Heritage	High (recorded cemetery in the study area)	High	Site Investigation and Heritage Impact Assessment
Palaeontology	Medium	Low	Palaeontological Impact Assessment

Recommendations:

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

- The extent of the recorded cemeteries and burial sites (Feature 1- 3 and MG002) should be avoided with a 30m buffer zone with access provided to family members;
    - » A Heritage Management plan must be compiled for the recorded cemeteries including an access protocol for the next of kin;
- Historical farmstead MG003 should also 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 palaeontological 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: • I act as an independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 49 A of the Act.
Signature	
Date	01/05/2025

a) 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

1 Introduction

The Applicant, Assmang (Pty) Ltd, applied for a mining right (MR), environmental authorisation (EA), and waste licence (WL) to mine Hematite, Magnetite, Goethite, Limonite, Siderite, Pyrolusite, Psilomelane, Rhodochrosite, Manganite, Braunite, Hausmannite, Manganese ore, Iron ore, and Diamonds (general) from 1 549.61 ha that extends over Portion 2 (portion of Portion 1), Remainder Portion, Remainder Portion of Portion 1 and Portion 3 of the farm Makganyene No 667 in the Tsantsabane Local Municipality of the Northern Cape. Greenmined Environmental (Pty) Ltd, appointed Beyond Heritage to conduct a Heritage Impact Assessment (HIA) for the proposed Project (Figure 1.1 to 1.3). 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, burial sites, an Historical farmstead, and exploration trenches, were recorded in the 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.

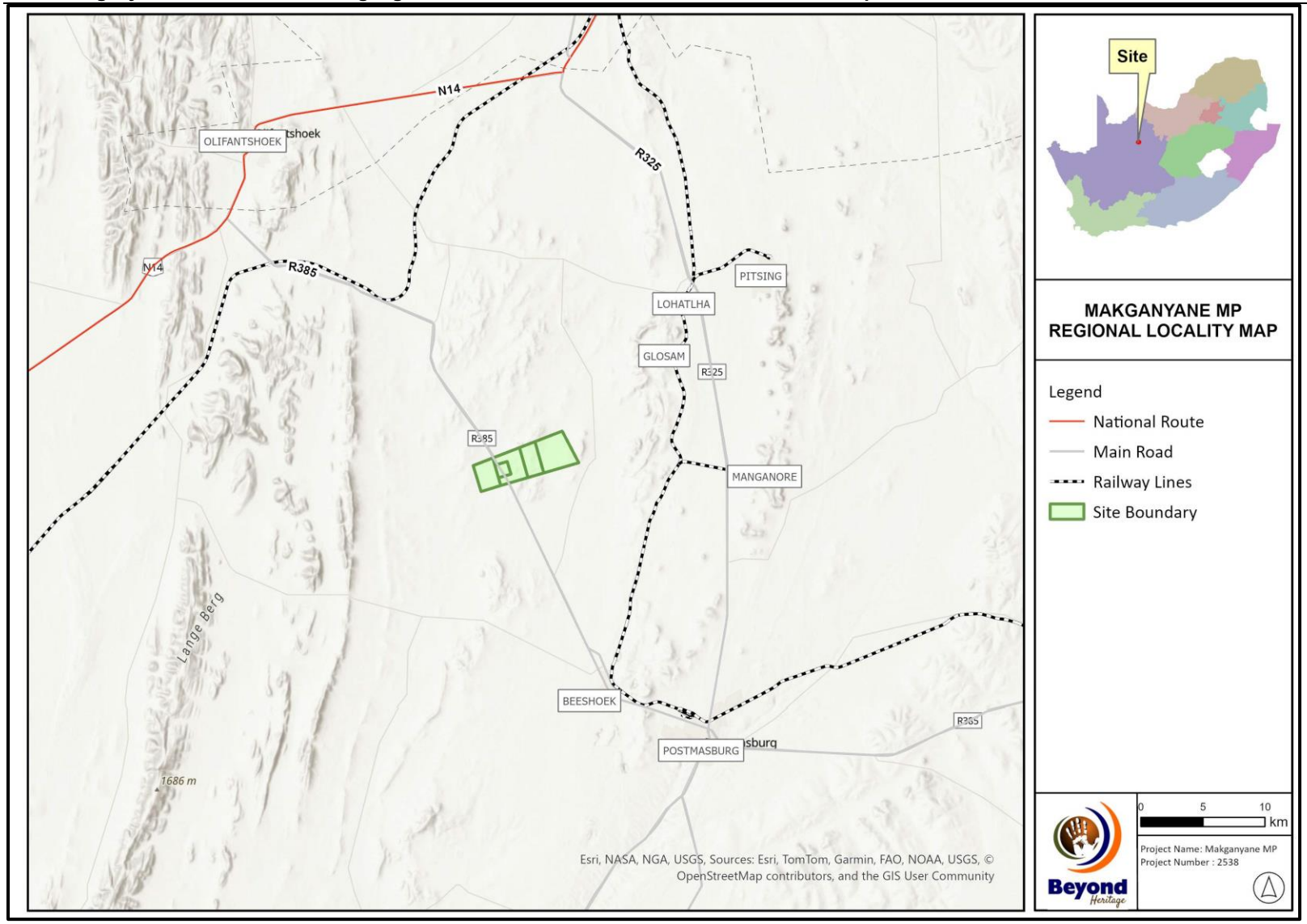

Figure 1.1. Regional setting of the Project (Extract of the 2282 1: 250 000 topographical map).

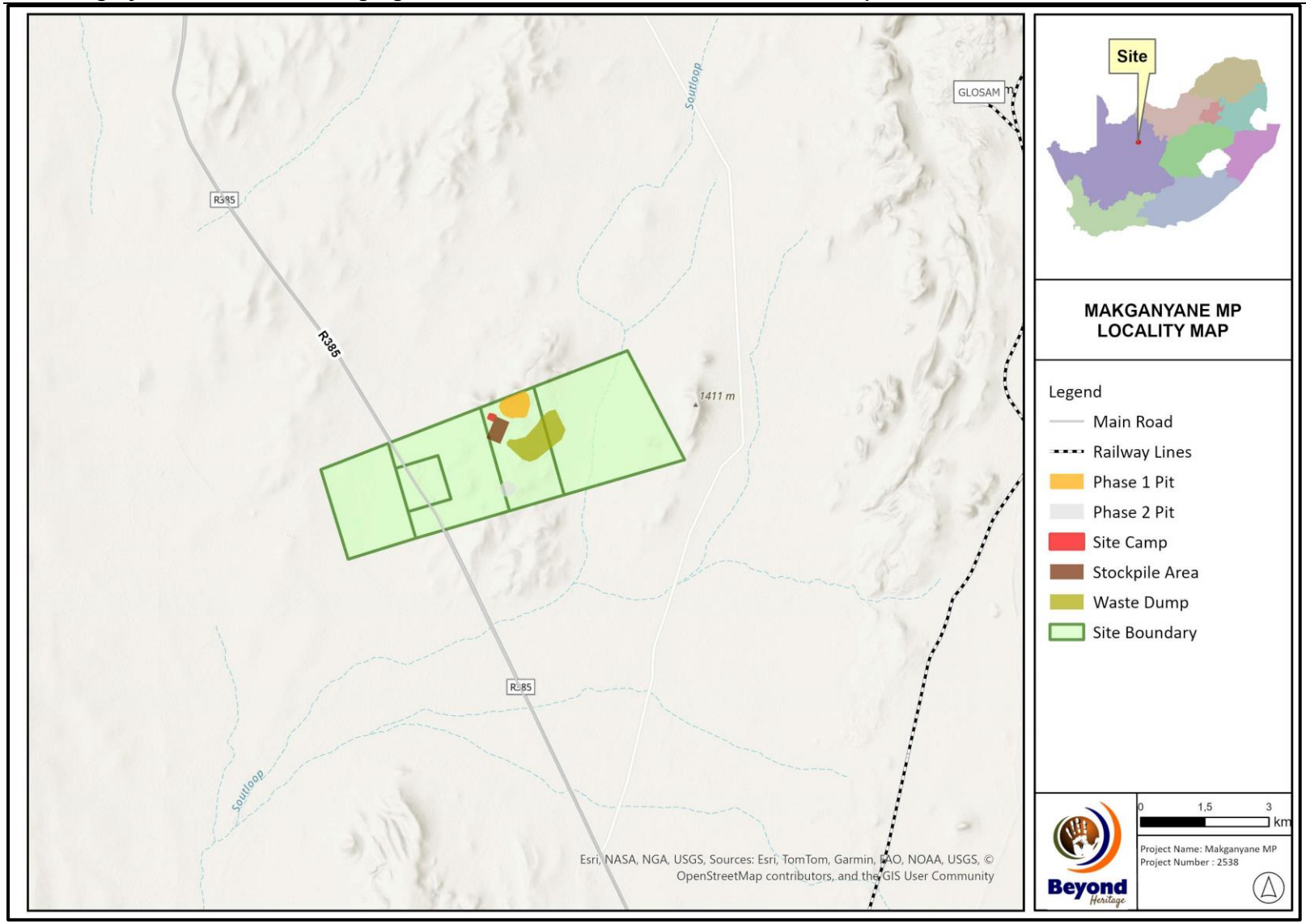

Figure 1.2. Local setting of the Project (Extract from 1:50 000 topographic map sheets 2282 BB).

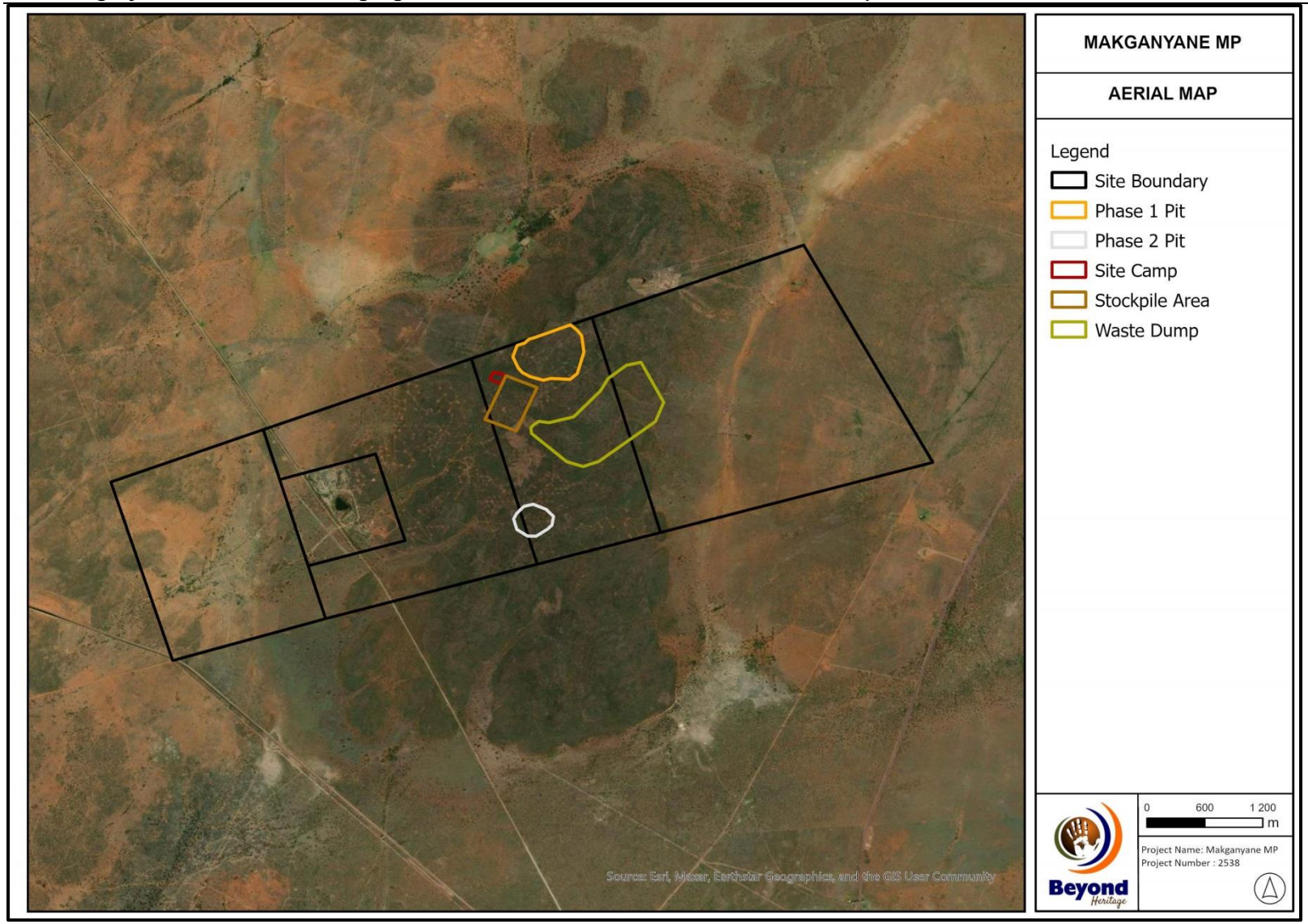

Figure 1.3. Aerial image of the Project area and surrounds.

1.1 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).

1.2 Project Description

Project components and the location of the Makganyane Iron Ore Mining Right are outlined in Tables 2 and 3.

Table 2: Project Description

Magisterial District	Tsantsabane Local Municipality within the Z F Mgcawu District Municipality
Central co-ordinate of the development	-28.147663° 22.934599°
1:50 000 Topographic Map Number	2822BB

Table 3: Infrastructure and project activities

Type of Development	Mining Development
Project details: The proposed activities will include Internal roads, office complex, ablution facilities, diesel depot, equipment workshop, office containers, parking area, planning / meeting site rooms, security access control, water reservoir, wash bays. stockpile area, crushing plant, weigh bridge and operations hut, excavations: pit 1 and pit 2, waste rock dump, water storage dam/s (for dewatering of the pits).	

1.3 Alternatives

No alternatives were provided for assessment. The extent of the area assessed allows for siting of the development within this area to minimize impacts to heritage resources.

2 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.

3 METHODOLOGY

3.1 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.

3.2 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.

3.3 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.

3.4 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	27 and 28 November 2019 7 September 2021 Week of 1 April 2025
Season	Archaeological visibility is high although some areas have been impacted on by mining activities. Access concerns were related to Blackthorn thickets and waterlogged areas after the recent rains. The Project area was however sufficiently covered to understand the heritage character of the area (Figure 3.1).

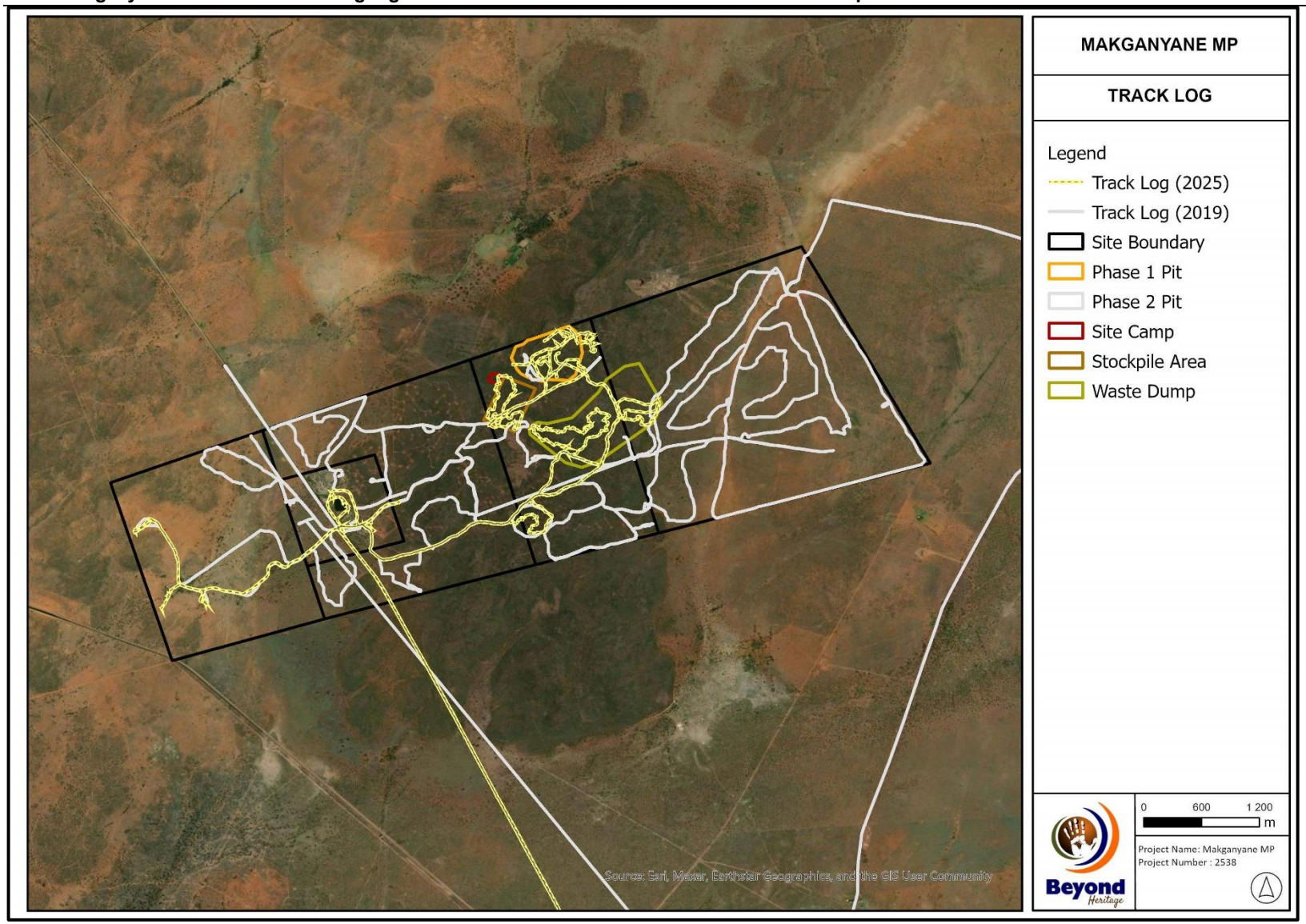

Figure 3.1. Tracklog of the survey path in green.

3.5 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

3.6 Impact Assessment Methodology

The following methodology for the assessment of the potential environmental, social and cultural impacts was provided by Greenmined Environmental (Pty) Ltd:

DEFINITIONS AND CONCEPTS

Environmental Significance

The concept of significance is at the core of impact identification, evaluation and decision-making. The concept remains largely undefined and there is no international consensus on a single definition. The following common elements are recognized from the various interpretations:

- δ Environmental significance is a value judgment
- δ The degree of environmental significance depends on the nature of the impact
- δ The importance is rated in terms of both biophysical and socio-economic values
- δ Determining significance involves the amount of change to the environment perceived to be acceptable to affected communities.

Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of acceptability) (DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5).

The concept of risk has two dimensions, namely the consequence of an event or set of circumstances, and the likelihood of particular consequences being realised (Environment Australia (1999) Environmental Risk Management).

Impact

The positive or negative effects on human well-being and / or the environment.

Consequence

The intermediate or final outcome of an event or situation OR it is the result, on the environment, of an event.

Likelihood

A qualitative term covering both probability and frequency.

Frequency

The number of occurrences of a defined event in a given time or rate.

Probability

The likelihood of a specific outcome measured by the ratio of a specific outcome to the total number of possible outcomes.

Environment

Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation (ISO 14004, 1996).

Methodology that will be used

The environmental significance assessment methodology is based on the following determination:

Environmental Significance = Overall Consequence x Overall Likelihood

Determination of Overall Consequence

Consequence analysis is a mixture of quantitative and qualitative information, and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: Severity/Intensity, Duration and Extent/Spatial Scale. Each factor is assigned a rating of 1 to 5, as described in the tables below.

Determination of Severity / Intensity

Severity relates to the nature of the event, aspect or impact to the environment and describes how severe the aspects impact on the biophysical and socio-economic environment.

Table 6: Table to be used to obtain an overall rating of severity, taking into consideration the various criteria.

TYPE OF CRITERIA	RATING				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant/ Harmful	Great/ Very harmful	Disastrous Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance/ Easily reversible	Low cost to mitigate	Substantial cost to mitigate/ Potential to mitigate impacts/ Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate/ Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Determination of Duration

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Table 7: Criteria for the rating of duration.

RATING	DESCRIPTION
1	Up to ONE MONTH
2	ONE MONTH to THREE MONTHS (QUARTER)
3	THREE MONTHS to ONE YEAR
4	ONE to TEN YEARS
5	Beyond TEN YEARS

Determination of Extent/Spatial Scale

Extent or **spatial scale** is the area affected by the event, aspect or impact.

Table 8: Criteria for the rating of extent / spatial scale.

RATING	DESCRIPTION
1	Immediate, fully contained area
2	Surrounding area
3	Within Business Unit area of responsibility
4	Within the farm/neighbouring farm area
5	Regional, National, International

Determination of Overall Consequence

Overall consequence is determined by adding the factors determined above and summarized below, and then dividing the sum by 3.

Table 9: Example of calculating overall consequence.

CONSEQUENCE	RATING
Severity	Example 4
Duration	Example 2
Extent	Example 4
SUBTOTAL	**10**
TOTAL CONSEQUENCE: (Subtotal divided by 3)	**3.3**

Determination of Likelihood

The determination of likelihood is a combination of Frequency and Probability. Each factor is assigned a rating of 1 to 5, as described below.

Determination of Frequency

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

Table 10: Criteria for the rating of frequency.

RATING	DESCRIPTION
1	Once a year or once/more during operation
2	Once/more in 6 Months
3	Once/more a Month
4	Once/more a Week
5	Daily

Determination of Probability

Probability refers to how often the activity or aspect has an impact on the environment.

Table 11: Criteria for the rating of probability.

RATING	DESCRIPTION
1	Almost never / almost impossible
2	Very seldom / highly unlikely
3	Infrequent / unlikely / seldom
4	Often / regularly / likely / possible
5	Daily / highly likely / definitely

Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarized below and then dividing the sum by 2.

Table 12: Example of calculating overall likelihood.

CONSEQUENCE	RATING
Frequency	Example 4
Probability	Example 2
SUBTOTAL	**6**
TOTAL LIKELIHOOD (Subtotal divided by 2)	**3**

Determination of Overall Environmental Significance

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of **LOW, LOW-MEDIUM, MEDIUM, MEDIUM-HIGH** or **HIGH**, as shown in the table below.

Table 13: Determination of overall environmental significance.

SIGNIFICANCE OR RISK	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
Overall Consequence X Overall Likelihood	1 - 4.9	5 - 9.9	10 - 14.9	15 – 19.9	20 - 25

Qualitative description or magnitude of Environmental Significance

This description is qualitative and is an indication of the nature or magnitude of the Environmental Significance. It also guides the prioritizations and decision making process associated with this event, aspect or impact.

Table 14*: Description of environmental significance and related action required.*

SIGNIFICANCE	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
Impact Magnitude	Impact is of very low order and therefore likely to have	Impact is of low order and therefore likely to have little	Impact is real, and potentially substantial in relation to other impacts.	Impact is real and substantial in relation to other impacts.	Impact is of the highest order possible. Unacceptable. Fatal flaw.

SIGNIFICANCE	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
	very little real effect. Acceptable.	real effect. Acceptable.	Can pose a risk to company	Pose a risk to the company. Unacceptable	
Action Required	Maintain current management measures. Where possible improve.	Maintain current management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk, where possible.	Improve management measures to reduce risk.	Implement significant mitigation measures or implement alternatives.

Based on the above, the significance rating scale has been determined as follows:

HIGH Of the highest order possible within the bounds of impacts which could occur. In the case of negative impacts, there would be no possible mitigation and / or remedial activity to offset the impact at the spatial or time scale for which it was predicted. In the case of positive impacts, there is no real alternative to achieving the benefit.

MEDIUM-HIGH Impacts of a substantial order. In the case of negative impacts, mitigation and / or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these. In the case of positive impacts, other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these.

MEDIUM Impact would be real but not substantial within the bounds of those, which could occur. In the case of negative impacts, mitigation and / or remedial activity would be both feasible and fairly easily possible, In case of positive impacts; other means of achieving these benefits would be about equal in time, cost and effort.

LOW-MEDIUM Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and / or remedial activity would be either easily achieved of little would be required, or both. In case of positive impacts alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time-consuming, or some combination of these.

LOW Impact would be negligible. In the case of negative impacts, almost no mitigation and or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap, and simple. In the case of positive impacts, alternative means would almost all likely be better, in one or a number of ways, than this means of achieving the benefit.

INSIGNIFICANT There would be a no impact at all – not even a very low impact on the system or any of its parts.

3.7 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.
- 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.

4 Description of Socio-Economic Environment

According to census 2011, there are 35 093 people in the municipality. Of these, 52,8% are African black, 37,6% are coloured, and 8,4% are white. Other population groups make up the remaining 1,2% of the population. Of those aged 20 years and older, 13,9% had some primary schooling, 5,3% had completed primary, 35,4% had some secondary, and 25,4 had matric. Only 6,4% had a higher qualification, and 13,7% had no form of schooling. Economically Tsantsabane is known for being rich in minerals, and for its mining, agriculture, manufacturing and farming sectors. Tsantsabane has reinvented itself over the years as one of the leading investment hot spots in the Northern Cape. The construction of the Anglo American Kumba Iron Ore's Kolomela mine has brought an implosion of development to the area

5 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.

6 Contextualising the study area

6.1 Archaeological Background

The archaeological record for the greater study area consists of the Stone Age and Iron Age.

6.1.1 Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. For Cultural Resources Management (CRM) purposes it is often only expected/ possible to identify the presence of the three main phases. Yet sometimes the recognition of cultural groups, affinities or trends in technology and/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable (Lombard 2011). 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 study area has a wealth of pre-colonial archaeological sites (Morris & Beaumont 2004). Famous sites in the region include the world renowned Wonderwerk Cave to the north of the study area. Closer to Kuruman two shelters on the northern and southern faces of GaMohaan (in the Kuruman Hills north west of the town) contain Later Stone Age remains and rock paintings. Rock art is known to occur at Danielskuil to the northeast and on Carter Block (Morris 2008). Middle Stone Age material is on record around the study area.

Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas were utilized for settlement of base camps close to water and hunting ranges.

According to Morris (2005) in the immediate area to the north of the study area, the Earlier Stone Age is represented by 11 known sites (Bruce, Kathu, Uitkoms, Sishen, Demaneng, Lylyveld and Mashwening); the Middle Stone Age by 5 sites (all in the vicinity of Kathu); and the Later Stone Age by 10 sites (one on King, one at Mashwening and eight at Kathu) Rock engravings have been identified from Sishen and Bruce (the Bruce site was salvaged and recorded by Fock & Fock 1984), as well as Beeshoek, to the east of the study area (Fock & Fock 1984, Morris 1992, Beaumont 1998). Specularite sources are known on Demaneng and Lylyveld and were mined in Stone Age times at a site on Doornfontein to the east of the study area (Beaumont 1973; Beaumont & Boshier 1974) and at Tsantsabane to the east of Postmasburg (Beaumont 1973, Thackeray et al. 1983): numerous other specularite workings have also been recorded (Beaumont 1973).

Stone Age artefacts are often recorded at industrial sites similar to the mining activities at Makganyane and the effects of heavy-duty earth moving machinery on the formation of lithic debitáge at open-air Stone Age/Palaeolithic sites was examined by Bradfield and Van der Walt (2018) at a site close to Kathu. The experiment with heavy-duty machinery produced only one pseudo-formal tool, most of the debitáge produced mimics that occasioned by knapping and this could attribute to some of the debitage/ artefacts identified on industrial sites.

6.1.2 Iron Age

Iron Age expansion southwards past Kuruman into the Ghaap plato and towards Postmasburg dates to the 1600's (Humphreys 1976, Thackeray 1983). Definite dates for Tswana presence in the Postmasburg area are around 1805 when Lichtenstein visited the area and noted the mining activities of the Tswana (probably the Thlaping) tribes in the area. The Thlaro and Thlaping settled the area from Campbell in the east to Postmasburg and towards the Langeberg close to Olifantshoek in the north west before 1770 (Snyman 1988). The Korana expansion after 1770 started to drive the Thlaro and Thlaping further north towards Kuruman (Shillington 1985); Morris (2005) indicated that three Iron Age sites close to the study area are on record (Demaneng, Lylyveld and Kathu).

6.1.3 Historical Information

Postmasburg is situated on the Cape Plateau, 1300 meters above sea level. An average of 325 millimeters of rain is usually recorded in the autumn and summer seasons. This area is semi-arid and forms part of the Kalahari thornveld biome. Farming practices include livestock cultivation and, to a much lesser degree, crop farming. It could not yet be determined with certainty what group of people had lived in the Postmasburg area before the Bushmen. However, a large number of stone tools, as well as glass beads, have been found in the Blinkklipkop ("Shiny Stone Hill"), which testifies to early human activity. (Snyman 1983: 1)

Rock paintings in the area serve as evidence that the hunter gatherer Bushmen had inhabited Griqualand West for centuries. In the 1770s, the Korana (people of Nama ancestry) moved into the Postmasburg area and disrupted the Bushmen's way of life. The Korana regularly visited a primitive mine in the Blinkklipkop, which today forms part of the town of Postmasburg, to exploit shimmering substances, namely hematite and specularite, which were mixed with fat and applied to the skin to give a sought-after shiny red appearance. With the later arrival of the Tswana, Korana, Griqua and Europeans the Bushmen gradually emigrated to the Kalahari, Botswana and Namibia. (Snyman 1983: Foreword, 1-3).

Figure 6.1. 1929 photograph of Blinkklipkop, with a cave in the right middle distance. Hematite and specularite were mined here. (NARSSA *SAB, MNW: 976 MM1204/29*).

The Tswana (Western Sotho) invaded the Northern Cape about 500 years ago, but the later Hay district in which Postmasburg was located was only occupied in the early 1800s. Long before settling in this area the Tswana also undertook journeys to Blinkklipkop to mine for the cosmetic substance that they called *sibilo*. In 1813 the missionary John Campbell came across a group of Bushmen near the mine and commented the following: "Blink Mountain is a kind of Mecca to the nations around, who are constantly making

pilgrimages to it, to obtain fresh supplies of the blue shining powder and the red stone." (Snyman 1983: 3-4)

In the 1820s the Griqua leader Andries Waterboer was able to expel his enemies, the Bergenaars of the Langeberge, from Blinkklip, as the area was called at the time. This became a permanent outpost of the Griqua tribe. The remaining Tswana and Bushmen either moved away or were assimilated by Waterboer's people. By the 1830s the Blinkklip population had grown to the extent that missionary of the London Mission Society, John Baillie, was stationed there for a time. Nikolaas Waterboer succeeded his father in 1853, and after this the tribe's authority in the area started to wane. Waterboer and his tribe became British subjects in 1871 after the British annexed Griqualand West. The discovery of diamonds further paved the way for white settlement in this district. (Snyman 1983: 4-5; Breutz 1963: 8)

The reason that the settlement of Europeans in Postmasburg took so long was that the country was so bare, waterless and stony that it was almost impossible to make a living there. Tribes that lived in the area occupied large parts of the country because it was so difficult to find water for their stock. It was only the later prosperity that came from mining that sparked agricultural development, the sinking of thousands of boreholes and the construction of roads. (Breutz 1963: 21)

Farms were surveyed by the British in the Griekwastad district in the 1870s, and between 1876 and 1878 the first farms owned by Europeans were purchased in this area. There were still a number of Griqua landowners in the area as well. The Griqualand West Rebellion disrupted life in the region in 1878, causing some to move away. In 1880 the Griqualand West district was incorporated into the Cape Colony and brought under formal administration. As of the early 1880s a much larger area surrounding Blinkklip was surveyed and more white settlers moved into the area. It was however only in 1882 with the establishment of a Reformed Church five kilometers south of Blinkklip that this settlement started to gain prominence. Between 1884 the Magistrate of the Hay district, J. J. Christie, lobbied for the establishment of a town at Blinkklip. This was already the most populous part of the Hay district. By the late 1880s the Reformed Church and its members were also campaigning for the establishment of the town, and on 30 November 1889 it was finally decided that the church would move to Blinkklip. The church was consecrated in Blinkklip on 28 February 1891, and a new Reformed Church building was completed in 1908. (Snyman 1983: 5-10, 43)

Figure 6.2. 1891 Consecration of the Reformed Church. (Snyman 1983: 43)

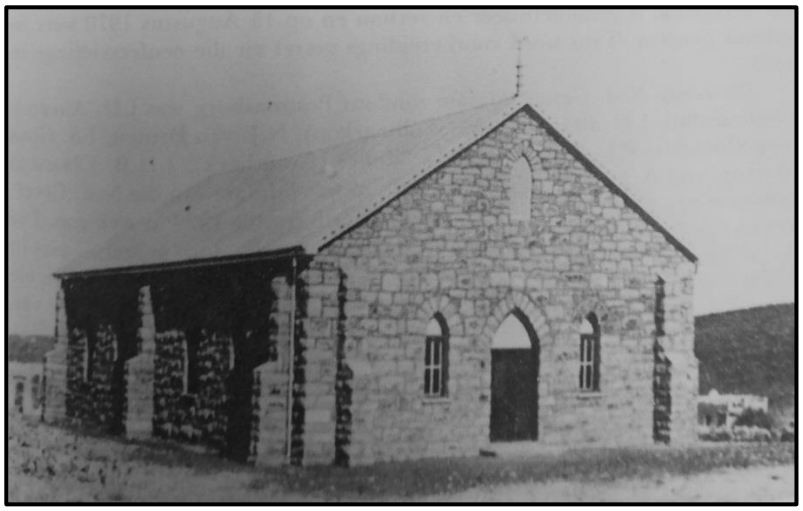

Figure 6.3. Reformed Church building (completed in 1908). (Snyman 1983: 43)

It was only in 1891 that 82 town plots were surveyed around the existing police station at Blinkklip. In the same year members of the church petitioned the Commissioner of Crown Lands to rename this town Postmasburg, in remembrance of Professor Dirk Postma, a minister of the Dutch Reformed Church in South Africa. This name change was affected in April 1892. (Snyman 1983: 10).

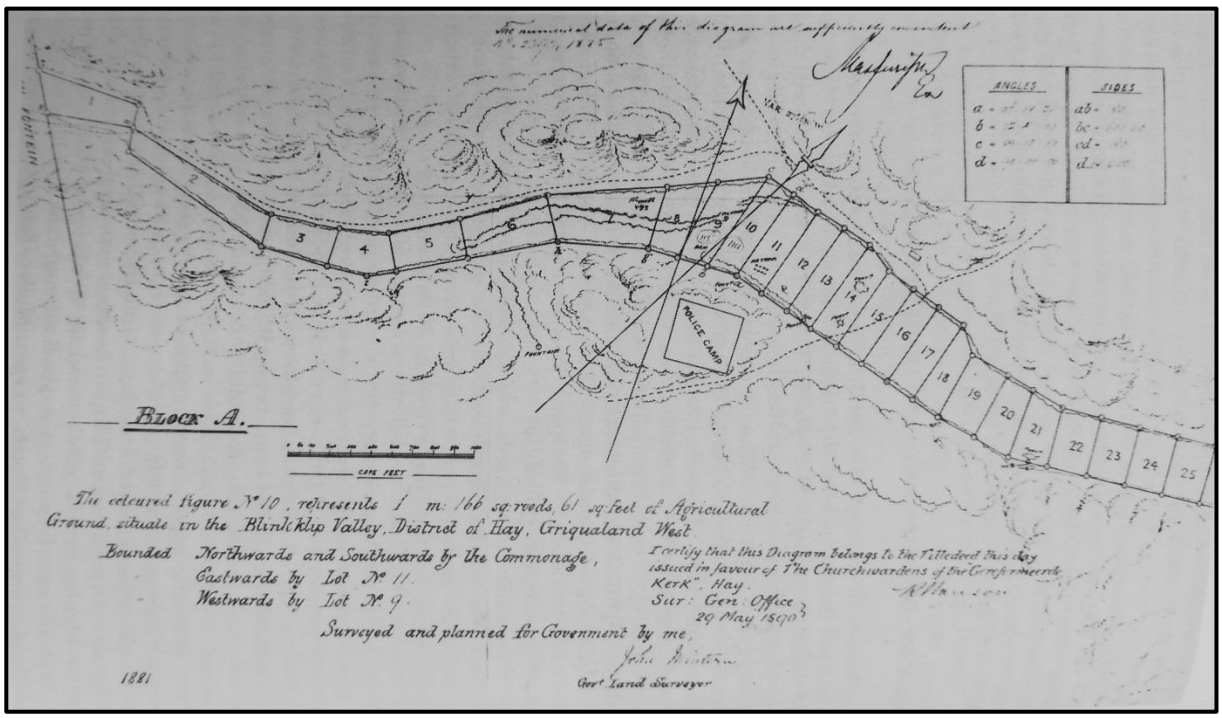

Figure 6.4. Portion of the first agricultural plots that were surveyed by John Minters in 1881 in the Blinkklip Valley. (Snyman 1983: 6)

By June 1892 there were only three buildings in the town of Postmasburg: a police station, a church building and a small house belonging to a policeman. This soon changed, and by March 1893 the little settlement that was established around a church had a post office, two shops, a partially completed school building

and twenty dwelling houses. The town's first town management council was elected in May of that year. (Snyman 1983: 10-11)

The manganese fields in the Postmasburg area were opened for prospecting in 1922, and this greatly boosted the development of the town and caused an influx of new residents. The economic depression of 1930 adversely affected mining in the area, but the town economy could still rely on the agricultural sector. Postmasburg became a municipality in 1936. (Snyman 1983: 12)

6.1.4 Anglo-Boer War

There are no battlefields or concentration camp sites close to the study area.

6.2 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 15.

Table 15. Studies consulted for the project.

Author	Year	Project	Findings
Beaumont, P.	2007	Phase 1 HIA for the Farm Makgananye, Postmasburg, Northern Cape.	8 Stone Artefacts, no sites of significance.
Van der Ryst, M.	2011	Specialist report on the Stone Age and other heritage resources at Kolomela, Postmasburg, Northern Cape	Stone Age features and historical features.
Kusel, U.	2013	Phase 1 AIA report on archaeological contexts and heritage resources on the farms Heuningkrans 364 and Langverwacht 432 in the Postmasburg District Municipality of the Northern Cape Province	Structures and Stone Age sites.
Van der Walt, J.	2019	Heritage Impact Assessment Makganyane Prospecting Application, Northern Cape Province	10 find spots consisting of isolated stone tools were recorded. The survey also recorded four features consisting of two cemeteries, a stone cairn that could possibly mark a pre-colonial burial and one feature relating to previous exploration
Van der Walt, J.	2021	Heritage Impact Assessment for the proposed Makganyane Mining Permit, Northern Cape Province	Middle Stone Age Scatters

6.3 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. The database of the Genealogical Society of South Africa indicated no known grave sites within the study area.

7 Heritage Baseline

7.1 Description of the Physical Environment

The general area consists of two kinds of topographical elements: undulating plains characterised by thick sand cover and a range of hills roughly splitting the area in two. Archaeological visibility is the lowest on the plains that are mantled with Aeolian sand and characterised by grass veld.

The vegetation and landscape are described by Mucina and Rutherford (*The Vegetation of South Africa, Lesotho and Swaziland*, South African National Biodiversity Institute, Kirstenbosch, August 2006) as Kuruman Mountain Bushveld and Olifantshoek Plains Thornveld. The geological forms in the study area are described as the Ongeluk formation and the Makganyene formation.

The lithology of the area consists of diamictite, subordinate sandstone, carbonate rock, jaspilite, mudrock, chert and biotite-muscovite metapelite. General site conditions are indicated in (Figure 7.1 to 7.6).

Figure 7.1. General site conditions in the study area.

Figure 7.2. General site conditions in the study area.

Figure 7.3. General site conditions – proposed Pit 1.

Figure 7.4. Surrounding area – proposed Pit 2.

Figure 7.5. General view of the proposed stockpile area.

Figure 7.6. General site conditions at the area for the proposed offices.

7.2 Heritage Resources

Based on the results of the field work and previous studies conducted in the area cultural layering dating back to the Stone Age with scatters and sites dating to the ESA, MSA and LSA are on record for the larger area. Sites and artefacts dating to these periods are scattered over the landscape with ESA and MSA artefacts found close to the Banded Iron Stone Ridges with isolated artefacts found on the thick Hutton sands marking the plains in the study area that is underlain by colluvial rubble. The contact zone between the Quaternary sands and the Banded Iron Stone at the foot of the ridges that divides the area in two is known to contain higher densities of lithics (e.g. Kusel 2013).

Ten Stone Age find spots and four features were recorded within the Project area (Figure 7.7, Table 16 & 17) in the initial survey in 2019. Find spots consist of isolated Stone Age artefacts and were recorded with the Prefix “FS” and numbered numerically. These isolated find spots are out of context and of no significance apart from mentioning them in this report. Artefacts are mostly undiagnostic although MSA and LSA elements were noted. Raw material varies and consists of Banded Iron Stone, Quartzsite and chert. The closest quartzite source is from the Langberge approximately 15 km away (Beaumont 2007) and therefore transported to the study area.

Van der Walt (2019) recorded four features consisting of three burial sites (two cemeteries and one stone cairn) and one feature relating to exploration. These sites were revisited and verified during the current study in April 2025 whereby an additional grave and Historical farmstead were recorded and given the prefix “MG”. Graves and burial sites are of high social significance (Field rating GP A) and the exploration trenches are of no heritage significance (Field Rating GPC). Additionally, a possible mining adit was investigated, however if present, the adit was closed during the course of previous mining activities in the area.

The General site distribution of the recorded observations in relation to the Project layout is spatially illustrated in Figure 7.7 and briefly described in Table 16 - 18. Selected features are illustrated in Figure 7.9. to 7.22.

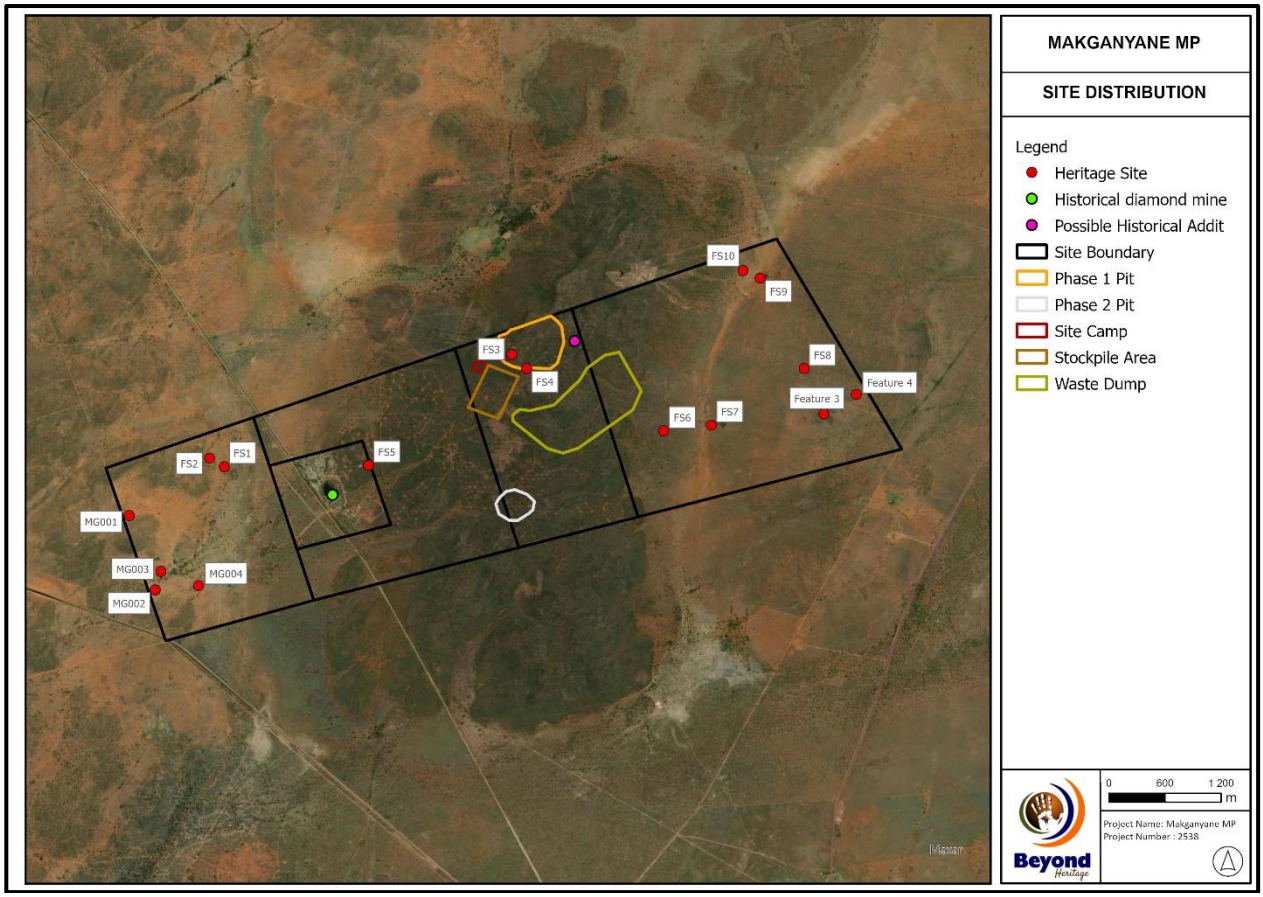

Figure 7.7. Site distribution map

Table 16. Stone Age scatters recorded in the study area.

Feature Number	Description	Longitude	Latitude	Source	Field Rating and Significance
FS1	Archaeological - Stone Age, Miscellaneous flake on quartzite	22° 54' 31.9320" E	28° 08' 59.4853" S	Van der Walt 2021	GP C Low
FS2	Archaeological - Stone Age, Flake with dorsal removals on quartzite	22° 54' 26.9245" E	28° 08' 56.6124" S	Van der Walt 2021	GP C Low
FS3	Archaeological – MSA, Pointed flake with dorsal removal and faceted striking platform	22° 56' 11.4613" E	28° 08' 20.7493" S	Van der Walt 2021	GP C Low
FS4	Archaeological – LSA, End and side scraper with use wear	22° 56' 16.5587" E	28° 08' 25.5444" S	Van der Walt 2021	GP C Low
FS5	Archaeological - Stone Age, Broken flake with bulb of percussion	22° 55' 21.8892" E	28° 08' 59.0351" S	Van der Walt 2021	GP C Low
FS6	Archaeological - Stone Age, Blade with dorsal removal on red sands	22° 57' 04.0537" E	28° 08' 47.0545" S	Van der Walt 2021	GP C Low
FS7	Archaeological - Stone Age, miscellaneous flake	22° 57' 20.5705" E	28° 08' 45.1321" S	Van der Walt 2021	GP C Low
FS8	Archaeological - Stone Age, miscellaneous flake	22° 57' 52.6391" E	28° 08' 25.5552" S	Van der Walt 2021	GP C Low
FS9	Archaeological - Stone Age	22° 57' 37.4473" E	28° 07' 54.2135" S	Van der Walt 2021	GP C Low
FS10	Archaeological - Stone Age, Miscellaneous flake with use wear/trampling on chert	22° 57' 31.4711" E	28° 07' 51.5569" S	Van der Walt 2021	GP C Low

Figure 7.8. Range of Stone tool artefacts recorded as find spots during the survey.

Table 17. Sites recorded in the study area in 2019

Label	Description	Longitude	Latitude	Field Rating and Significance
Feature 1	Peens family cemetery. Fenced in with granite headstones	22° 54' 23.4577" E	28° 09' 40.3741" S	GP 3A High Significance
Feature 2	Stone packed graves of farm labourers	22° 53' 59.4635" E	28° 09' 16.3549" S	GP 3A High Significance
Feature 3	Stone cairn on small hill possibly pre-colonial grave	22° 57' 59.4505" E	28° 08' 41.2655" S	GP 3A High Significance
Feature 4	Exploration trenches measuring approximately three by two meters	22° 58' 10.6535" E	28° 08' 34.4616" S	GP C Low Significance

Table 18. Additional sites recorded in the study area in 2025

Label	Description	Longitude	Latitude	Field Rating and Significance
MG002	A single, historical grave which is stone packed and has a headstone with inscription.	22°54'8.04"E	28° 9'42.19"S	GP 3A High Significance
MG003	A large Historical farmstead which consists of multiple structures and a water reservoir. Some of the structures are partially dilapidated.	22°54'10.00"E	28° 9'35.72"S	GP B Medium Significance

Figure 7.9.Feature 1 - Peens family cemetery (Van der Walt 2019).

Figure 7.10. Feature 1 fenced in (Van der Walt 2019).

Figure 7.11. Stone packed graves at Feature 2 (Van der Walt 2019).

Figure 7.12. Stone packed graves at Feature 2 (Van der Walt 2019).

Figure 7.13. Stone cairn - Feature 3 (Van der Walt 2019).

Figure 7.14. Feature 3 on top of small hill (Van der Walt 2019).

Figure 7.15. Feature 4 - Exploration trench (Van der Walt 2019).

Figure 7.16. Rocks from trench at Feature 4 (Van der Walt 2019).

Figure 7.17. General site conditions at the possible historical adit (2025 Survey). No indicators of the feature were visible at the time of the survey.

Figure 7.18. General site conditions at the possible historical adit (2025 Survey). No indicators of the feature were visible at the time of the survey.

Figure 7.19. Single grave at MG002 (2025 Survey).

Figure 7.20. Partially demolished structure at farmstead MG003 (2025 Survey).

Figure 7.21. Structure which is still in good condition at farmstead MG003 (2025 Survey).

Figure 7.22. Partially demolished structure at farmstead MG003 (2025 Survey).

7.3 Cultural Landscape

Historical land use and the cultural landscape are linked since the cultural landscape is shaped to some extent by the history of the area. The general area is associated with agriculture and mining developments with widespread Stone Age occurences. The farmstead MG003 is illustrated on historical maps from 1967 (Figure 7.23) and is likely older than 60 years and is protected by the NHRA (Section 34).

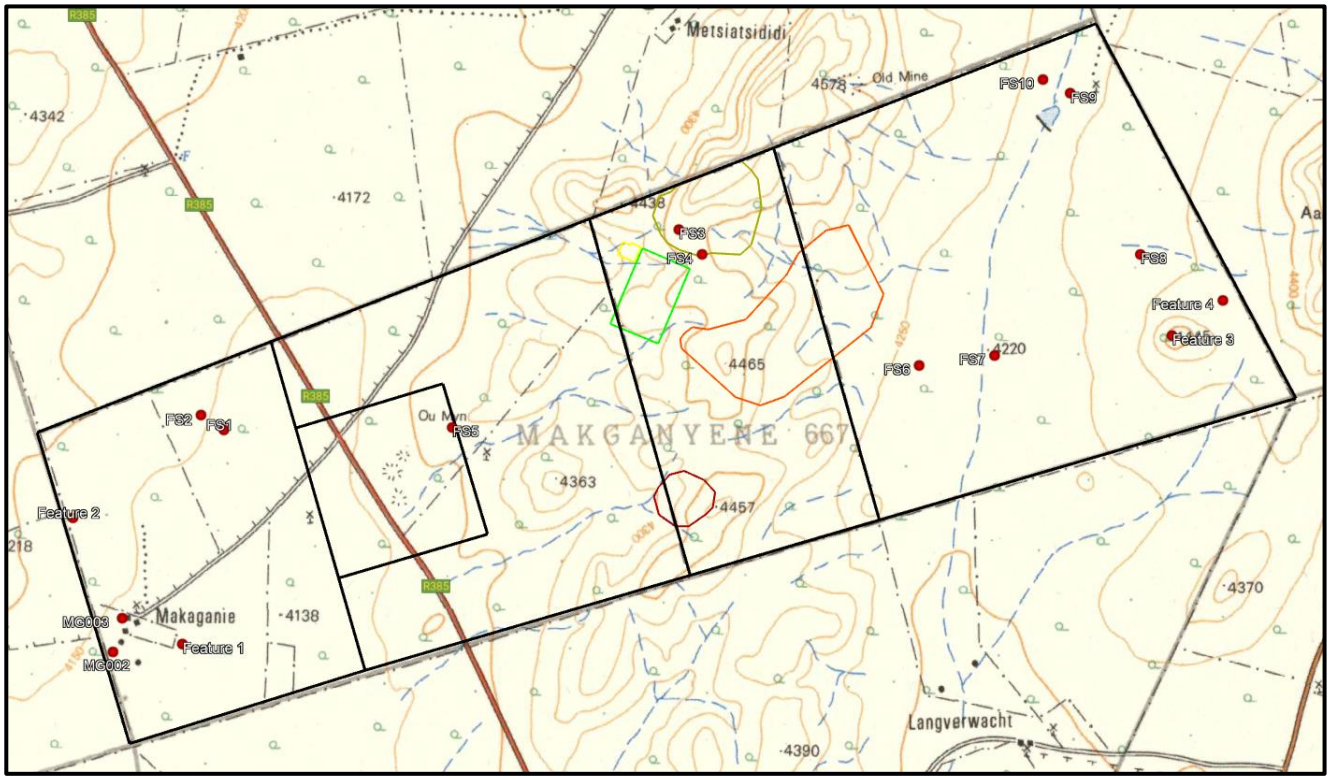

Figure 7.23. Extract of the 1967 topographic map (1: 50 000) illustrating structures and a windmill associated with the farmstead MG003. A small area of diggings is illustrated in the Project area.

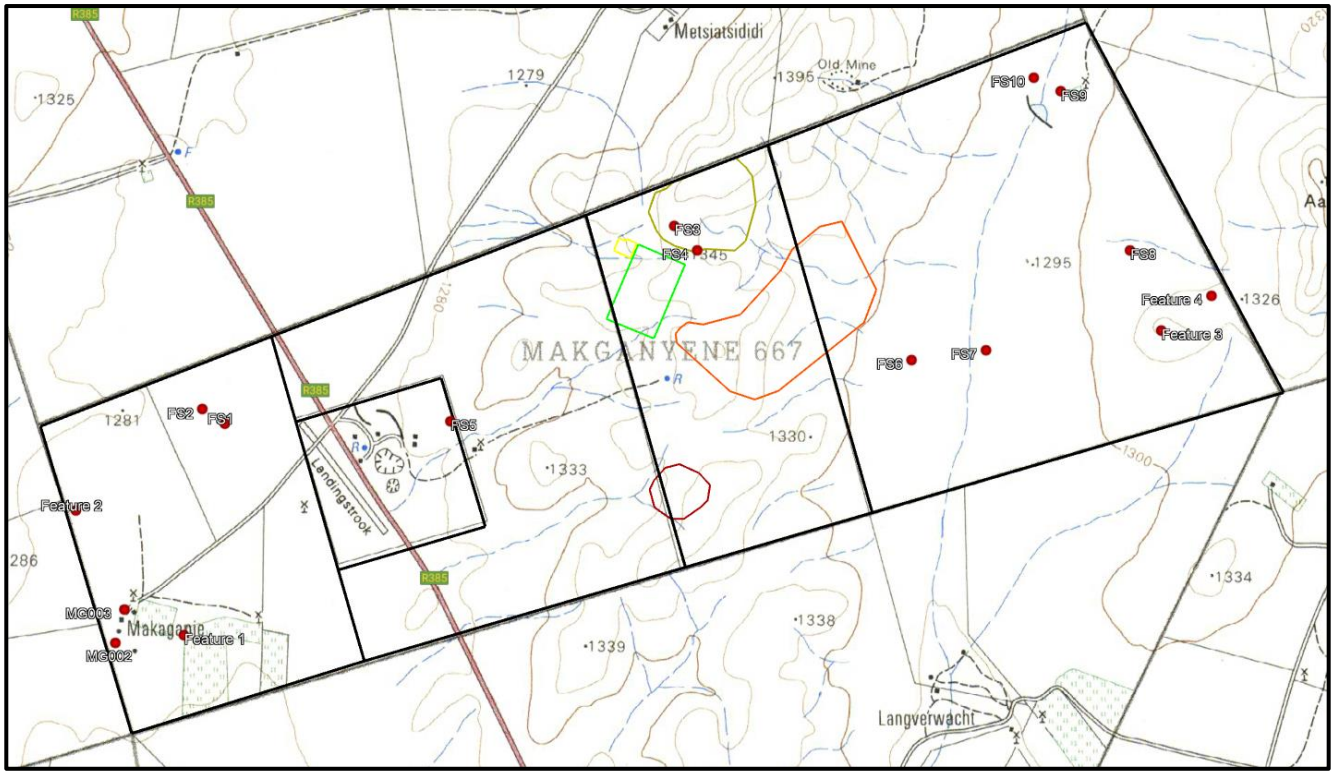

Figure 7.24. Extract of the 1982 topographic map (1: 50 000) illustrating expanding mining and structures within the Project area.

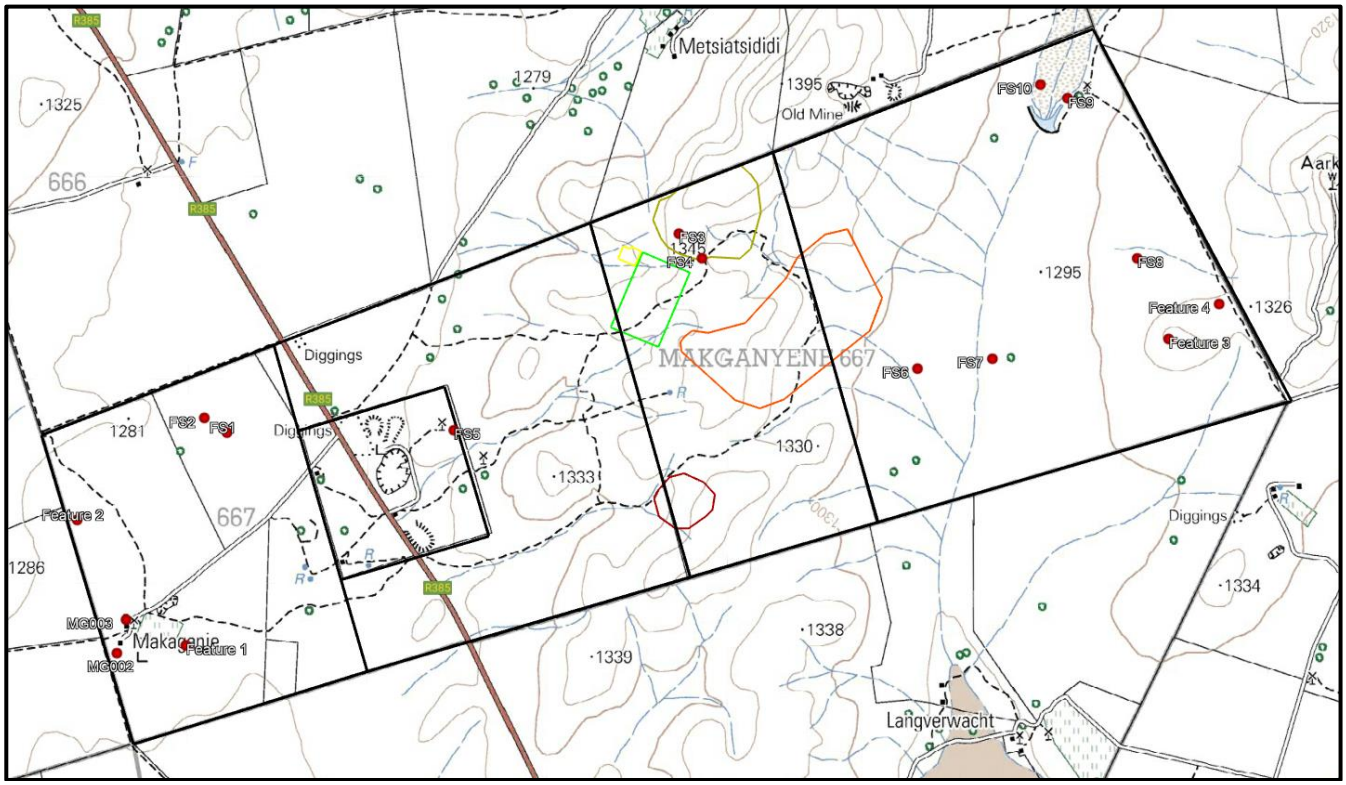

Figure 7.25. Extract of the 2009 topographic map (1: 50 000) illustrating further expansion of the mining within the Project area.

7.4 Paleontological Heritage

According to the SAHRA palaeontological sensitivity map, the study area is indicated as of moderate palaeontological sensitivity (Figure 7.26), and an independent study was commissioned for this aspect (Bamford 2025). The study concluded that the proposed site lies on the non-fossiliferous Makganyene Formation (Postmasburg Group) diamictites and partly on moderately sensitive Gordonia Formation sands. No fossils have been reported from this area. 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.

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

8 Assessment of impacts

8.1 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.

The low-density Stone Age scatters in the project area are scattered too sparsely to be of significance apart from mentioning them in this report and although impact is probable, it will be low (Table 19). Based on Van der Walt (2019) the exploration trenches are of no heritage significance apart from mentioning them in this report.

The recorded burial sites and cemeteries (Feature 1 -3 and MG002) must be added to the development plans and avoided with a 30m buffer zone. The sites are of high social significance, and it will be avoided by the Project activities and therefore will not be directly impacted on (Table 20).

The Historical farmhouse MG003 is of heritage significance due to its age and must be added to development plans and avoided with a 30m buffer zone. The farmstead is of medium heritage significance, and it will be avoided by the Project activities and therefore will not be directly impacted on (Table 21).

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.

Table 19. Impact assessment for the low-density scatters and exploration trenches.

Environmental Significance				
5.825 Low				
Overall Consequence			**Overall Likelihood**	
7/3 = 2.333			**5/2 = 2.5**	
Severity/Intensity	Duration	Extent/Spatial Scale.	Frequency	Probability
1	5	1	1	4

Table 20. Impact Assessment for recorded burial sites.

Environmental Significance				
7				
Overall Consequence			**Overall Likelihood**	
14/3 = 4.66			**3/2 = 1.5**	
Severity/Intensity	Duration	Extent/Spatial Scale.	Frequency	Probability
5	5	4	1	2

Table 21.Impact assessment for the Historical farmhouse.

Environmental Significance				
5				
Overall Consequence			**Overall Likelihood**	
10/3 = 3.33			**3/2 = 1.5**	
Severity/Intensity	Duration	Extent/Spatial Scale.	Frequency	Probability
4	5	1	1	2

8.1.1 Cumulative impacts

Cumulative impacts in the area are increasing as developments take place within an archaeologically sensitive landscape. The cumulative impact of the Project area on heritage resources is low with adherence to the recommendations within this report.

9 Conclusion and recommendations

The terrain is predominantly rocky, characterised by the slopes of a small valley between two ridges. The Iron Ore that will be mined is located close to the surface but covered with a gravel infill. A Background scatter of isolated MSA artefacts were recorded, possibly washed down from higher up on the ridge. The artefacts are all made from the abundance of raw material (Chert and Quartzite) originating from the Banded Iron Stone formation characteristic of the area and include cores, blades and flakes with faceted striking platforms characteristic of the MSA. The stone tools are isolated, out of context and scattered too sparsely to be of significance apart from mentioning them in this report and is given a field rating of GP C. This is in line with studies by Beaumont (2007) and van der Walt (2019) on the same farm currently assessed that recorded isolated artefacts and concluded that the study area is of low archaeological significance. During the previous survey (van der Walt 2019), two cemeteries and one stone cairn as well as exploration trenches were recorded in the study area. Burial sites are of high significance and should be avoided.

During the 2025 survey, two additional heritage resources were recorded, a burial site (MG002), and the Historical farmstead (MG003). Although these sites will not be impacted, they should be added to development plans along with the graves at Feature 1-3 and avoided with a 30m buffer zone.

According to the South African Heritage Resource Authority (SAHRA) Paleontological sensitivity map the study area is of moderate palaeontological sensitivity and a Desktop study was conducted for this aspect. Bamford (2025) concluded that the proposed site lies on the non-fossiliferous Makganyene Formation (Postmasburg Group) diamictites and partly on moderately sensitive Gordonia Formation sands. No fossils have been reported from this area. 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.

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.

9.1 Recommendations for condition of authorisation

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

- The extent of the recorded cemeteries and burial sites (Feature 1- 3 and MG002) should be avoided with a 30m buffer zone with access provided to family members;
    - » A Heritage Management plan must be compiled for the recorded cemeteries including an access protocol for the next of kin;
- Historical farmstead MG003 should also 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 palaeontological chance finds, if chance finds are encountered to implement the Chance Find Procedure for the Project as outlined in Section 9.

9.2 Chance Find Procedure

9.2.1 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.

9.2.2 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 (for example see Bamford 2025). 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.

9.3 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.

9.4 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.

9.5 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 22. 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: 1. Cease all works immediately; 2. Report incident to the Sustainability Manager; 3. Contact an archaeologist to inspect the site; 4. Report incident to the competent authority; and 5. Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. Only recommence operations once impacts have been mitigated.

9.6 Management Measures for inclusion in the EMPr

Table 23. 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
Cemeteries and stone cairn	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
Historical Farmstead MG003	The Historical Farmstead should be added to development plans and avoided with a 30m buffer zone.	Throughout the Project	Throughout the Project	Applicant Construction Contractor	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34, 35, 36 and 38 of NHRA	ECO Checklist/Report

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