

UPDATING THE MINE WORKS PROGRAM FOR THE KAMEELHOEK MINE NEAR POSTMASBURG IN THE NORTHERN CAPE PROVINCE.

Heritage Impact Assessment (HIA) Report

March 2022

CREDIT SHEET

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Statement of Independence

As the duly appointed representative of G&A Heritage, I Stephan Gaigher, hereby confirm my independence as a specialist and declare that neither I nor G&A Heritage have any interests, be it business or otherwise, in any proposed activity, application or appeal in respect of which the Environmental Consultant was appointed as Environmental Assessment Practitioner, other than fair remuneration for work performed on this project.

SIGNED BY: STEPHAN GAIGHER



MANAGEMENT SUMMARY

Project Name and Location

Updating the Mine Works Program which includes the Water Use Licence Application, Environmental Management Program Report Amendments and the Environmental Permit Applications for the Kameelhoek Mine located on the Farm Kameelhoek no. 477 Portion 1 and the remainder of Farm 478, near Postmasburg in the Northern Cape Province.

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Date of Report

31 March 2022

MANAGEMENT SUMMARY

The purpose of the management summary is to distil the information contained in the report into a format that can be used to give specific results quickly and facilitate management decisions. It is not the purpose of the management summary to repeat in shortened format all the information contained in the report, but rather to give a statement of results for decision making purposes.

This study focuses on the proposed update of the Mine Works Program, which includes the Water Use Licence Application, Environmental Management Program Report Amendments and the Environmental Permit Applications for the Kameelhoek Mine located on the Farm Kameelhoek no. 477, Portion 1 and the remainder of Farm 478 near Postmasburg in the Tsantsabane Local Municipality, ZF Mgcawu District of the Northern Cape Province.

This study encompasses the heritage impact investigation. A preliminary layout has been supplied to lead this phase of this study.

Scope of Work

A Heritage Impact Assessment (including Archaeological, Cultural heritage, Built Heritage, and Basic Palaeontological Assessment) to determine the impacts on heritage resources within the study area.

The following is required to perform this assessment:

- A desk-top investigation of the area;
- A site visit to the proposed development site;
- Identify possible archaeological, cultural, historic, built and palaeontological sites within the proposed development area;
- Evaluate the potential impacts of construction and operation of the proposed development on archaeological, cultural, historical resources; built and palaeontological resources; and
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural, historical, built and palaeontological importance.

The purpose of this study is to determine the possible occurrence of sites with cultural heritage significance within the study area. The study is based on archival and document combined with fieldwork investigations.

Findings and Recommendations

The Kameelhoek Mine located on Portion 1 of the Farm Kameelhoek No. 477 and the remainder of Farm 478 near Postmasburg in the Tsantsabane Local Municipality, ZF Mgcawu District of the Northern Cape Province was investigated during a field visit and through archival studies.

Although several stone tools were noticed over the survey area, only two sites of higher concentrations were noted along non-perennial pans on the northern side of the farm. It is recommended that all the pan areas on the property undergo a second phase of investigation if they are to be mined. The two known sites should undergo second phase investigation if they are to be mined. At this stage only one pan (which is not one of the high-concentration stone tool pans) will be affected by the proposed mining. It is recommended that this site undergo more thorough investigation before mining commence to clear it of possible high value heritage sites.

A mining exclusion zone has been indicated for the occupational areas and gravesites associated with the historic homestead. This exclusion zone should be adhered to. If the mine planning changes in the foreseeable future, mitigation of these sites will apply.

The SAHRIS *PalaeoSensitivity* Map places the site within multiple designations, namely red, orange, green and blue. On this basis a Field-based Palaeontological Impact Assessment is required. A full field based PIA report accompanies this report.

Fatal Flaws

No fatal flaws were identified.

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ABBREVIATIONS

Abbreviation	Meaning
BP	Before Present
c.	circa
BCE	Before the Common Era
Bp	Before Present
CE	Common Era
ECO	Environmental Control Officer
EIA	Early Iron Age
ELO	Environmental Liaison Officer
ESA	Early Stone Age
ESMS	Environmental and Social Management System
ESSS	Environmental and Social Safeguard Standards
Fm	Femtometre (10 ⁻¹⁵ m)
GPS	Geographic Positioning System
HIA	Heritage Impact Assessment
ICP	Informed Consultation and Participation
LIA	Late Iron Age
LSA	Late Stone Age
KZN	KwaZulu-Natal
MSA	Middle Stone Age
MYA	Million Years Ago
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
PIA	Palaeontological Impact Assessment
PS	Performance Standard
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Information System
SAPS	South African Police Service
SHE	Safety, Health and Environment
SHEQ	Safety, Health, Environment and Quality
S&EIR	Scoping and Environmental Impact Reporting
Um	Micrometre (10 ⁻⁶ m)
WGS 84	World Geodetic System for 1984

GLOSSARY OF TERMS

'Archaeological' means:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

'Circa' is used in front of a particular year to indicate an approximate date.

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

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

A **'place'** is defined as:

- a) A site, area or region;
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Structures' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

1. General

1.1 Project Description and Location

Project location

Essential Prospects 101 (Pty) Ltd (“Essential Prospects”) intends to develop an iron and manganese ore mining operation near Postmasburg in the Northern Cape Province of South Africa. The Kameelhoek Mine project is located approximately 15 km west of the town of Postmasburg on Farm Kameelhoek no. 477, Portion 1 and the remainder of Farm 478. The site is situated in the Tsantsabane Local Municipality and ZF Mgcawu District Municipality. The location of the mining rights area is indicated in **Error! Reference source not found.**

The site proposed for development is owned by Sishen Iron Ore Company (Pty) Ltd. A mining right application and Environmental Authorisation (“EA”) process was undertaken in 2015 for the proposed Kameelhoek Mine. Essential Prospects was awarded an EA on 12 December 2016, while the mining right (“MR”) was granted on 24 November 2017 (reference number: NC30/5/1/2/2/10088 MR). Changes to the mine layout and design that received environmental authorisation in 2016 is now proposed that requires that a full Scoping and EIA process is followed to obtain the necessary authorisations.

Approximate coordinates for the centre of the site are:

Latitude: - 28.313391°

Longitude: 22.884385°

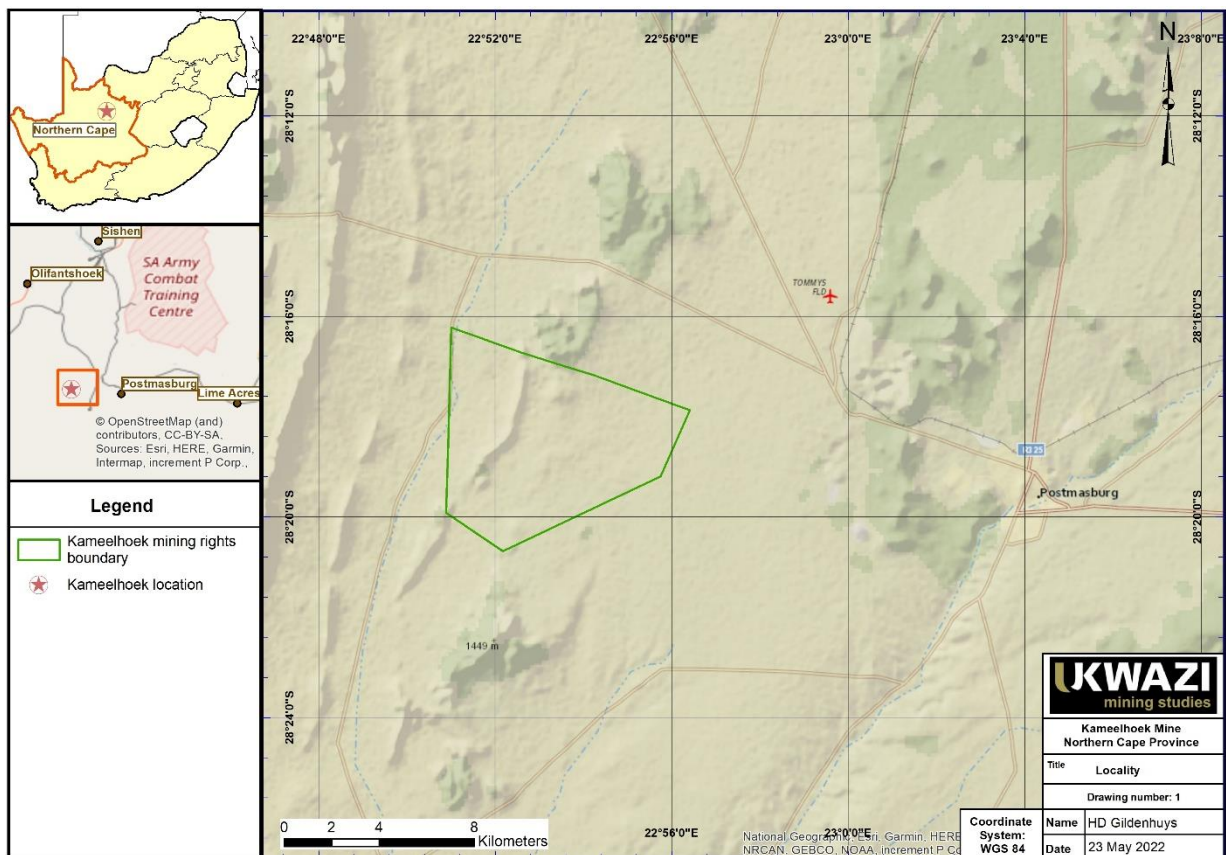


Figure 1. Project location map

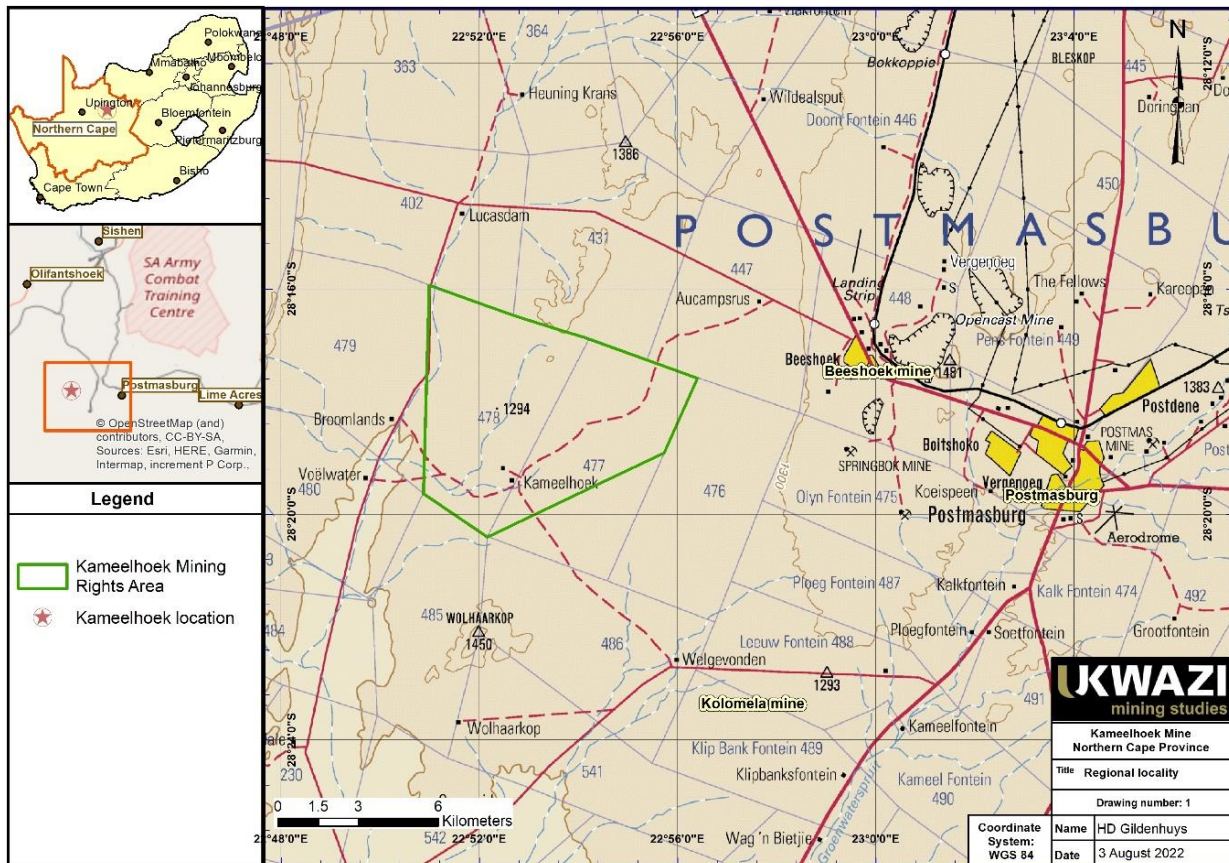


Figure 2: Project locality map 2

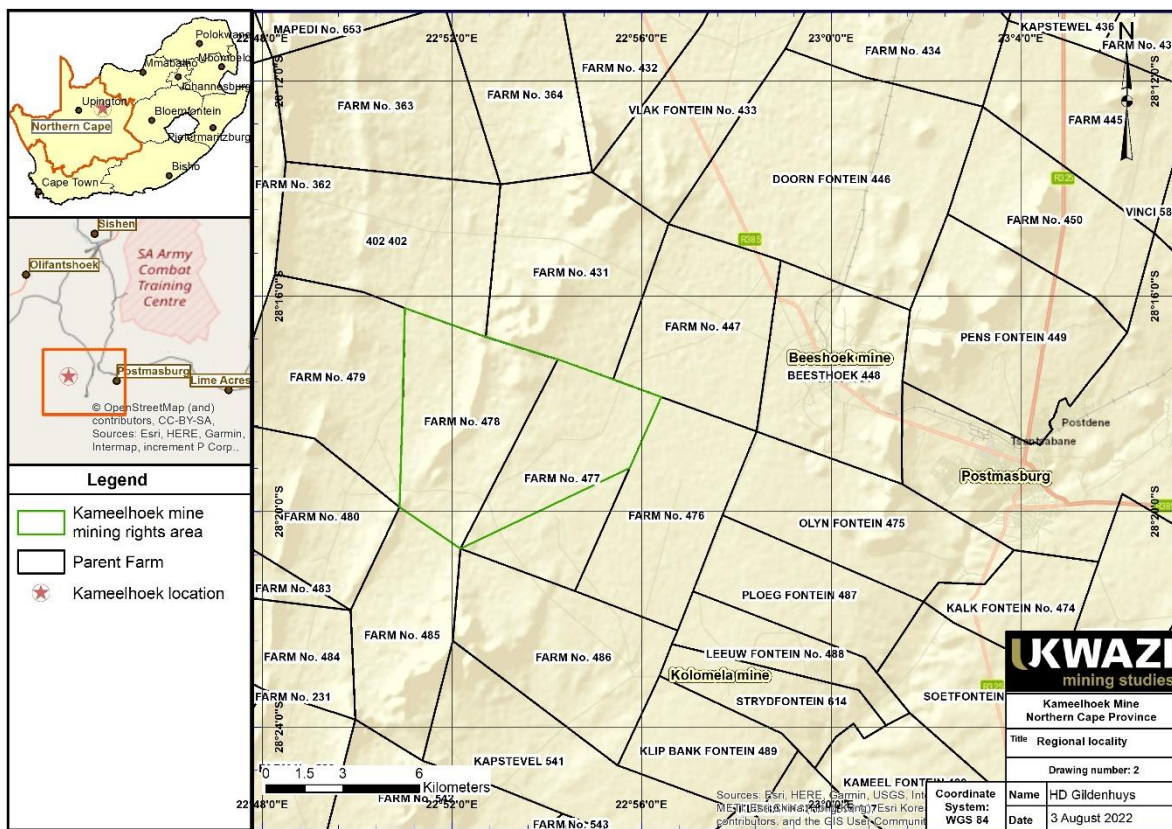


Figure 3: Project locality map 3

Description of activities to be undertaken

Overview

The proposed mine will mine iron ("Fe") and manganese ("Mn") ore. During the first two years of the Life of Mine ("LOM") the target will be to mostly mine high-grade ore sources (A+, A and B types) located to the south of the mining right area. The planned on-site processing plant (for the processing of lower C grade ores) is scheduled to be constructed during this time. The A+ grade ROM material will be crushed (on-site) and transported to Kolomela mine as direct shipping ore. All A and B grade ROM material will be crushed and transported to Sishen mine for further processing. All C grade material will be mined and stockpiled during the first two years and then processed at the on-site processing plant. The proposed beneficiation plant will be configured to process both Fe ore and Mn ore through the same facility and will also allow for the processing of ore from external sources for toll processing.

The LOM is planned for 12 years, after which direct mine rehabilitation and closure activities is scheduled to be completed over a period of approximately two years.

The main infrastructure requirements for the mine include:

- Open pits
- Access roads, internal roads and service roads
- Eskom power distribution lines and sub-station
- Pipelines
- Perimeter fencing and access control
- Administration offices, change houses, workshops and wash bays
- Run of Mine ("ROM") crusher
- Process plant, including crushing, screening, grinding, milling and high-intensity magnetic separation circuits
- Topsoil stockpiles
- Mine residue facilities (two waste rock facilities and one combined co-disposal facility tailings and waste rock)
- ROM and product stockpiles
- Pollution control dams
- Sewage treatment plant
- Salvage yard.

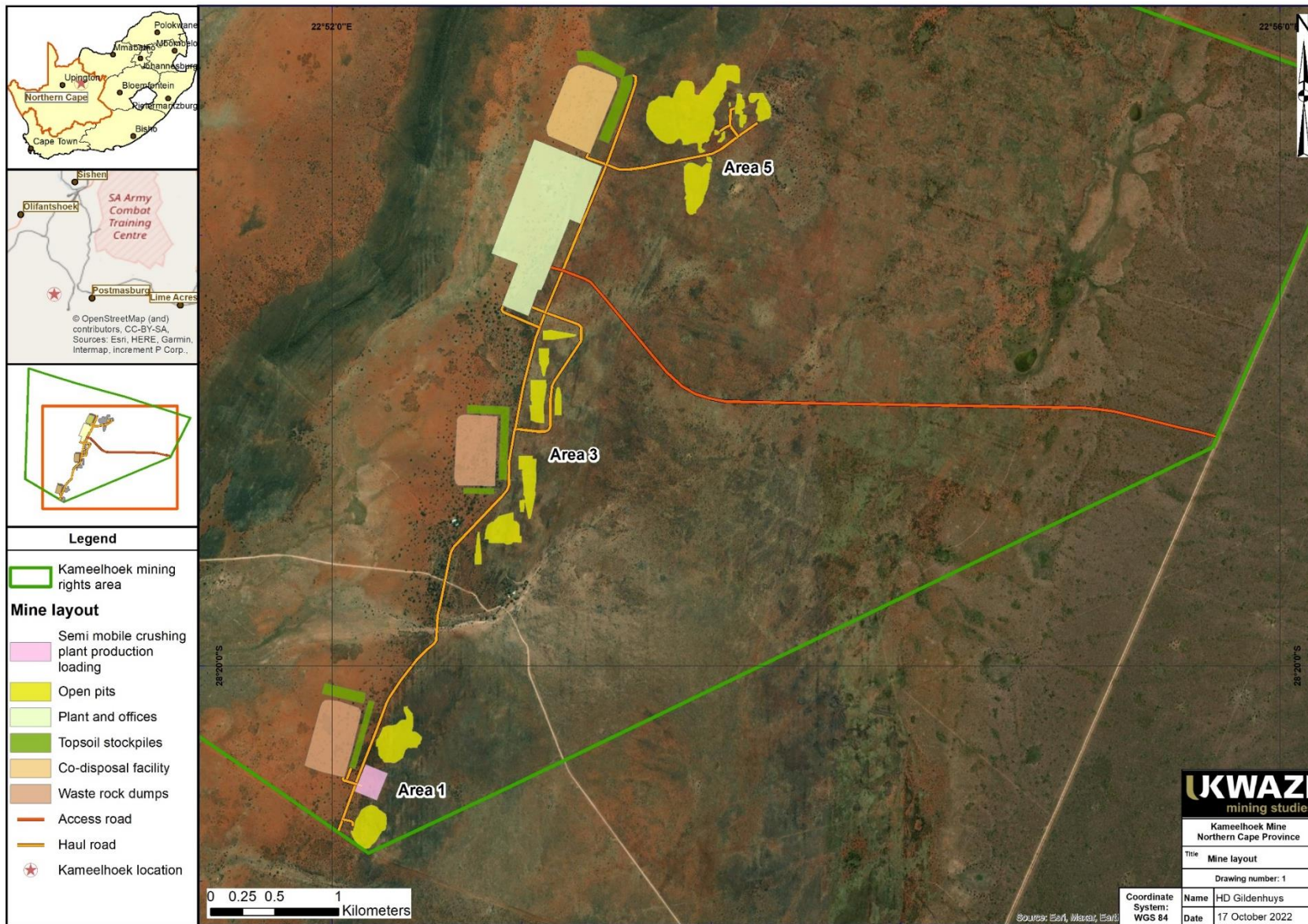


Figure 1: Proposed mine layout

Mining method

The mining method will be based on conventional open pit mining (drill-blast-load-haul). Specific activities include road construction, grubbing, topsoil removal, waste mining and hauling, ore mining and hauling, drilling of waste and ore material, ramp construction, road maintenance and rehabilitation earthworks activities.

Mine residue and topsoil facilities

Topsoil will be removed separately from other materials and stockpiled on dedicated stockpiles. Waste material and any low-grade material (less than 40%Fe) will be placed on dedicated mine residue facilities. Three mine residue facilities are proposed, one per mining area. The southern and central mine residue facilities will be designed to accommodate waste rock, while the northernmost facility will be a co-disposal facility, which is a combination of waste rock and tailings.

Open pits

Seven target areas with iron ore potential were investigated for the placement of open pits based on exploration holes that were previously drilled. Three areas in the centre of the MRA were selected for the placement of the open pits namely Areas 1, 3 and 5. For Area 1, two pits were designed, Area 3 consisted of nine pits, while Area 5 consisted of eight pits. Two open pits were however removed from Area 3 as they were located within a heritage buffer zone surrounding a graveyard and farmhouse.

Access and haul roads

The Kameelhoek project area will be serviced by three access roads. The main plant access and primary product logistics route will be provided by a new 3km secondary mining road, feeding into the D3226 secondary provincial road via an existing privately-owned mining road running on the borders of Kolomela Mine, Aucampsrus Mine and the Transnet rail servitude. The D3226 intersects the main bitumen access road to Kolomela Mine after a bridge crossing over the Transnet iron ore export rail line, from where access is attained near the Beeshoek Mine to the provincial and national road network via the R385 road between Postmasburg and Olifantshoek. With the exception of A+- grade ROM, all inbound and outbound logistics will be transported via the main access route.

The second entrance road to Kameelhoek Mine will provide restricted direct access to Kumba Iron Ore's Kolomela Mine. Located at the southernmost point of the mine, this secondary mining road will be used for delivering A+- grade Fe ore ROM to Kolomela Mine, and potentially to return lower-grade Fe ore feedstocks for toll treatment through the concentrator plant.

The third access route follows the existing farming access road which exists the property on the western side onto a privately-owned secondary road and turning north before linking into the D3226 secondary provincial road. This access route will exclusively be utilised for environmental and agricultural activities on the Kameelhoek mining right area.

Haul roads (15m wide) were designed around the mining pits on surface and followed the closest practical route to mine residue facility locations.

The seaborne Fe ore concentrate product (66% Fe concentrate) produced by the Kameelhoek beneficiation plant will be transported on road from the site and then by rail to:

- The existing Iron Ore Export Channel via the multi-purpose terminal at Saldanha, or
- The greenfields multi-commodity port facility envisaged to be developed at Boegoebaai in the Northern Cape.

All other products (Fe ore ROM, Fe ore blending concentrate, chemical-grade Mn concentrate) will be sold locally to other mining operations or ex-mine to offtake clients using road-based logistics.

Electricity supply

Beneficiation on site will consist of two sections: a semi-mobile in-pit crushing station and a fixed concentrator plant.

The fixed beneficiation plant will require a power consumption of around 12.9GWh per annum (21.5kWh/ton feed). A 32kVA Eskom power supply to the project area will be required, augmented by a diesel genset to support critical process systems during unplanned power outages.

The in-pit crushing station will operate using electricity provided by a diesel generator. The genset and associated switchgear will be containerised to make it relocatable.

Water provision

The crushing, coarse screening and grinding circuits of the Kameelhoek beneficiation plant will be dry processes, with water requirements limited to dust suppression and plant washdown water only. The fines screening, milling and high-intensity magnetic separation circuits will be full wet beneficiation processes producing Fe ore concentrate and slimes tailings streams. Both the concentrates and tailings streams will be dewatered separately through high-pressure filter press units to maximise process water recovery.

Water requirements for the proposed mining and processing activities are planned to be extracted from suitable boreholes (pending regulatory applications and approvals) located at strategic positions across the mining right area. Potable water will be used for change house facilities and other areas where high quality water is required. Mine water will be re-used where possible for all industrial applications and general dust suppression.

Labour requirements

The mine's operating model consists of contractors conducting all mining activities. Processing operations is based on an owner operated model with an appropriate owner appointed management team overseeing the consolidated operations. The mining contractors labour complement was estimated at 75 and the owner's team (mine management, engineering and processing) was estimated at 180, with a consolidated labour complement of 255.

1.2 Technical Scope of HIA

This HIA focused only on the areas to be directly affected by the proposed development and is meant to deliver, evaluate and inform on the following aspects:

- (a) The identification and mapping of all heritage resources in the area affected;
- (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in the relevant legal descriptions, development proponent requirements and as per international best practise approaches and charters;
- (c) An assessment of the impact of the development on such heritage resources;
- (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
- (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

The following categories of heritage objects are considered.

Graves: Places of interment including the contents, headstone or other marker of and any other structures on or associated with such place. This may include any of the following:

- 1) Ancestral graves,
- 2) Royal graves and graves of traditional leaders
- 3) Graves of victims of conflict i.e. graves of important individuals
- 4) Historical graves and cemeteries older than 60 years
- 5) Other human remains, buried or otherwise.

The removal of graves is subject to the following procedures:

- Notification of the impending removals (using local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the relevant controlling body;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

Movable objects: This includes objects such as historic or rare books and manuscripts, paintings, drawings, sculptures, statuettes and carvings; modern or historic religious items; historic costumes, jewellery and textiles; fragments of monuments or historic buildings; archaeological material; and natural history collections such as shells, flora, or minerals. Discoveries and access resulting from a project may increase the vulnerability of cultural objects to theft, trafficking or abuse. This may include any of the following:

- 1) Objects recovered from the soil or water including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- 2) Ethnographic art and objects
- 3) Military objects
- 4) Objects of decorative art
- 5) Objects of fine art
- 6) Objects of scientific or technological interest
- 7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings
- 8) Any other prescribed categories, but excluding any object made by a living person.

Protection of Historic Battlefields

Heritage “Places”: A ‘place’ is defined as:

- a) A site, area or region;
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and
- d) An open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.
- e) Traditional Buildings used in cultural ceremonies.

Heritage Structures: Refers to single or groups of architectural works found in urban or rural settings providing evidence of a particular civilisation, a significant development or a historic event. It includes groups of buildings, structures and open spaces constituting past or contemporary human settlements that are recognised as cohesive and valuable from an architectural, aesthetic, spiritual or socio-cultural perspective. This may also include any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

Archaeological Sites

Archaeological sites comprise any combination of structural remains, artefacts, human or ecological elements and may be located entirely beneath, partially above, or entirely above the land or water surface. Archaeological material may be found anywhere on the earth’s surface, singly or scattered over large areas. Such material includes burial areas, human remains, artefacts and fossils. Archaeological sites may include:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and

- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked, whether on land or in the maritime cultural zone, and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

Sacred or Spiritual Sites: Refers to natural features with cultural significance, which may include sacred hills, mountains, landscapes, streams, rivers, waterfalls, caves and rocks; sacred trees or plants, groves and forests; carvings or paintings on exposed rock faces or in caves; and palaeontological deposits of early human, animal or fossilised remains. This heritage may have significance to local community groups or minority populations.

1.3 Geographical / Spatial Scope of HIA

The geographic and spatial scope of the HIA centres on the proposed update of the Mine Works Program, which includes the Water Use Licence Application, Environmental Management Program Report Amendments and the Environmental Permit Applications for the Kameelhoek Mine located on Portion 1 of the Farm Kameelhoek no. 477 and the remainder of Farm 478 near Postmasburg in the Tsantsabane Local Municipality, ZF Mgcawu District of the Northern Cape Province.

Any sites within the directly impacted study area that can be affected by the proposed development and, where known, are included in this report. Mitigation or secondary investigations take this footprint as the spatial parameters of the study area.

1.4 Temporal Scope

The proposed project will consist of three phases;

- 1) Planning
- 2) Development / Construction
- 3) Operational

Due to the nature of the proposed development, impacts on heritage sites are anticipated both during the construction and operation phase of the development.

2. Legislative Context

2.1 National Legislation

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

- (a) *Construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*
- (b) *Construction of a bridge or similar structure exceeding 50 m in length; and*
- (c) *Any development, or other activity which will change the character of an area of land, or water –*
 - (1) *Exceeding 10 000 m² in extent;*
 - (2) *Involving three or more existing erven or subdivisions thereof; or*
 - (3) *Involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or*
- (d) *The costs of which will exceed a sum set in terms of regulations; or*
- (e) *Any other category of development provided for in regulations.*

While the above describes the parameters of developments that fall under this Act., Section 38 (8) of the NHRA is applicable to this development. This section states that;

- (8) *The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.*

In regard to a development such as this that falls under Section 38 (8) of the NHRA, the requirements of Section 38 (3) applies to the subsequent reporting, stating that;

- (3) *The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:*
 - a) *The identification and mapping of all heritage resources in the area affected;*
 - b) *An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;*
 - c) *An assessment of the impact of the development on such heritage resources;*
 - d) *An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;*
 - e) *The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;*
 - f) *If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and*
 - g) *Plans for mitigation of any adverse effects during and after the completion of the proposed development.*
 - 1) *Ancestral graves,*
 - 2) *Royal graves and graves of traditional leaders,*
 - 3) *Graves of victims of conflict (iv) graves of important individuals,*
 - 4) *Historical graves and cemeteries older than 60 years, and*
 - 5) *Other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);*
 - h) *Movable objects, including:*
 - 1) *Objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects and material, meteorites and rare geological specimens;*

- 2) Ethnographic art and objects;
- 3) Military objects;
- 4) Objects of decorative art;
- 5) Objects of fine art;
- 6) Objects of scientific or technological interest;
- 7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
- 8) Any other prescribed categories, but excluding any object made by a living person;
- i) Battlefields;
- j) Traditional building techniques.

A **'place'** is defined as:

- a) A site, area or region;
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Structures' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

'Archaeological' means:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this heritage impact assessment are as follows;

- Field investigations were performed on foot and by vehicle where access was readily available.
- Sites were evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases.
- It was assumed that the site layout as provided by Ukwazi is accurate.
- We assumed that the public participation process performed as part of the Basic Assessment process was sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	Yes	HIA
	35	Archaeological, palaeontological and meteor sites	No impact	None
	36	Graves and burial sites	Yes	HIA
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	No	N/A
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	Yes	HIA
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m ²	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

3. Methodology

3.1 Heritage Management

This study defines the heritage component of the EIA process being undertaken for the proposed update of the Mine Works Program, which includes the Water Use Licence Application, Environmental Management Program Report Amendments and the Environmental Permit Applications for the Kameelhoek Mine located on the Farm Kameelhoek no. 477, Portion 1 and the remainder of Farm 478 near Postmasburg in the Tsantsabane Local Municipality, ZF Mgqawu District of the Northern Cape Province.

It is described as a first phase (HIA). This report attempts to evaluate both the accumulated heritage knowledge of the area and information derived from direct physical observations.

3.2 Inventory

Inventory studies involve the in-field survey and recording of archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of the overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are several different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984*).

3.3 Evaluating Heritage Impacts

A combination of document research as well as the determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed.

After plotting of the site on a GPS the areas were accessed using suitable combinations of vehicle access and access by foot.

Sites were documented by digital photography and geo-located with GPS readings using the WGS 84 datum. An aerial drone was used to evaluate the site from different heights and to improve coverage of the area.

Further techniques (where possible) included interviews with local inhabitants, visiting local museums and information centers and discussions with local experts. All this information was combined with information from an extensive literature study as well as the result of archival studies based on the SAHRA (South African Heritage Resource Agency) provincial databases.

This Heritage Impact Assessment relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRIS (South African Heritage Resources Information System) Database of Heritage Studies
- Historic Maps
- 1982 and 2009 Surveyor General Topographic Map series
- Google Earth 2020 imagery
- Published articles and books
- JSTOR Article Archive

3.4 Site Visit / Fieldwork Details

Fieldwork for the HIA was done on the 29th of March 2022. The area was found to be accessible by vehicle and areas of possible significance were investigated on foot. The survey was tracked using GPS and a track file in GPX format is available on request.

The study area was surveyed using standard archaeological surveying methods. The area was surveyed using directional parameters supplied by the GPS and surveyed on foot. This technique has proven to result in the maximum coverage of an area.

Standard archaeological documentation formats were employed in the description of sites. Using standard site documentation forms as comparable medium, it enabled the surveyors to evaluate the relative importance of sites found. Furthermore, GPS (Global Positioning System) readings of all finds and sites were taken. This information was then plotted using a **Garmin Colorado** GPS (WGS 84- datum).

Indicators such as surface finds, plant growth anomalies, local information and topography were used in identifying sites of possible archaeological importance. Test probes were done at intervals to determine sub-surface occurrence of archaeological material. The importance of sites was assessed by comparisons with published information as well as comparative collections.

Test excavation is that form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location, which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development. It may also be referred to as archaeological testing' (DAHGI 1999a, 27).

'Test excavation should not be confused with, or referred to as, archaeological assessment which is the overall process of assessing the archaeological impact of development. Test excavation is one of the techniques in carrying out archaeological assessment which may also include, as appropriate, documentary research, field walking, examination of upstanding or visible features or structures, examination of aerial photographs, satellite or other remote sensing imagery, geophysical survey, and topographical assessment' (DAHGI 1999b, 18).

3.5 Assumptions

It was assumed that the impacted areas will be limited to the proposed development. It is furthermore assumed that the *PalaeoSensitivity* Map provided on the SAHRIS platform is comprehensive enough to inform on actions in this regard and the intrusive effects of the development would be sufficiently limited not to impact on any palaeontological resources.

3.6 Gaps / Limitations / Uncertainty

None.

3.7 Specialist Specific Methodology

The scope of work includes:

- the identification and assessment of archaeological, cultural, historic, and built sites within the study area.
- Archival study of existing data and information for the study area.
- Site inspection and fieldwork.
- This site work includes communicating with local inhabitants to confirm possible locations of heritage and cultural sites.
- Impact assessment has been performed according to the methodology as described in the relevant Impact Evaluation.

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined

through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

3.8 Visual Impact Assessment Methodology

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV Architects and The Department of Environmental Affairs and Development Planning (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalised. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimise the visual impact.

A stand-alone visual assessment was conducted and the specialist concluded that visual impacts to scenic routes and sense of place is not expected to be high with mitigation.

4. Findings

4.1 Built Environment

Some structures associated with farming and rural living were identified in the area surrounding the study area and across the road from the study area.

- Farmhouses and outbuildings
- Kraals
- Dirt roads
- Fences
- Power lines
- Wind pumps
- Footpaths

Mitigation

The previous HIA concluded that the farmhouses and burial sites were of significant enough heritage value to deserve conservation. These will be omitted from the proposed development.

4.2 Cultural Landscape

The cultural landscape is strongly associated with farming and rural living.

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1 Palaeontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Unlikely
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Likely
3 Historic Built Environment	<ul style="list-style-type: none"> - Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement 	Yes	Likely
4 Historic Farmland	These possess distinctive patterns of settlement and historical features such as: <ul style="list-style-type: none"> - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 	Yes	Likely
5 Historic rural town	<ul style="list-style-type: none"> - Historic mission settlements - Historic townscapes 	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> - Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation 	Yes	Unlikely

	<ul style="list-style-type: none"> - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance. 		
7 Relic Landscape	<ul style="list-style-type: none"> - Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement, 	No	No
8 Burial grounds and grave sites	<ul style="list-style-type: none"> - Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years) 	Yes,	Yes
9 Associated Landscapes	<ul style="list-style-type: none"> - Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory 	No	No
10 Historical Farmyard	<ul style="list-style-type: none"> - Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology 	Yes	Yes
11 Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No	No
12 Scenic visual	<ul style="list-style-type: none"> - Scenic routes 	No	No
13 Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors 	No	No



Figure 3. Cultural Landscape

4.3 Natural Landscape

The majority of the study area is flat low-lying Kalahari bush with stony ridges and plateaus.



Figure 4. Natural Landscape



Figure 5. Natural Landscape



Figure 6. Natural Landscape

4.4 Battlefields and Concentration Camps

There are no battlefields or related concentration camp sites located within the study area.

The dry stone-walled circular blockhouse at Daniëlskuil is located approximately 60km East-northeast (75°) from the study area. This blockhouse, erected by the British Garrison stationed in the area during the Anglo-Boer War (1899-1902) is excellent example of these stone blockhouses. ...On the 5th of January 1901, a force of 500 Boers attacked the British but lost the battle due to their strategic advantage. Captain George Callum, who commended the Duke of Edenburg's Own Volunteer Rifles at Daniëlskuil, received the Distinguished Service Order for his bravery and leadership in the battle.



Figure 7. Blockhouse at Daniëlskuil

5. Measuring Impacts

In 2003 the SAHRA (South African Heritage Resources Agency) compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

- **Type of Resource**
 - Place
 - Archaeological Site
 - Structure
 - Grave
 - Palaeontological Feature
 - Geological Feature

- **Type of Significance**
 - Historic Value
 - Important in the community, or pattern of history
 - Important in the evolution of cultural landscapes and settlement patterns
 - Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
 - Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
 - Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.
 - It has strong or special association with the life or work of a person, group or organisation of importance in history
 - Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.
 - It has significance relating to the history of slavery
 - Importance for a direct link to the history of slavery in South Africa.

 - Aesthetic Value
 - It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.
 - Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
 - Importance for its creative, design or artistic excellence, innovation or achievement.
 - Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
 - In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

 - Scientific Value
 - It has potential to yield information that will contribute to an understanding of natural or cultural heritage
 - Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
 - Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.

- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

a) Does the site contain evidence, which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

- internal stratification and depth
- chronologically sensitive cultural items
- materials for absolute dating
- association with ancient landforms
- quantity and variety of tool type
- distinct intra-site activity areas
- tool types indicative of specific socio-economic or religious activity
- cultural features such as burials, dwellings, hearths, etc.
- diagnostic faunal and floral remains
- exotic cultural items and materials
- uniqueness or representativeness of the site
- integrity of the site

b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

- monitoring impacts from artificial or natural agents
- site preservation or conservation experiments
- data recovery experiments
- sampling experiments
- intra-site spatial analysis

c) Does the site contain evidence which can make important contributions to palaeo environmental studies?

- topographical, geomorphological context
- depositional character
- diagnostic faunal, floral data

d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

o Social Value / Public Significance

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- integrity of the site
- technical and economic feasibility of restoration and development for public use

- visibility of cultural features and their ability to be easily interpreted
- accessibility to the public
- opportunities for protection against vandalism
- representativeness and uniqueness of the site
- aesthetics of the local setting
- proximity to established recreation areas
- present and potential land use
- land ownership and administration
- legal and jurisdictional status
- local community attitude toward development

b) Does the site receive visitation or use by tourists, local residents or school groups?

○ Ethnic Significance

Does the site presently have traditional, social or religious importance to a particular group or community?

- ethnographic or ethno-historic reference
- documented local community recognition or, and concern for, the site

○ Economic Significance

What value of user-benefits may be placed on the site?

- visitors' willingness-to-pay
- visitors' travel costs

○ Scientific Significance

a) Does the site contain evidence, which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?

b) Does the site contain evidence, which can make important contributions to other scientific disciplines or industry?

○ Historic Significance

a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?

b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?

c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?

d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?

○ Public Significance

a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- visibility and accessibility to the public
- ability of the site to be easily interpreted
- opportunities for protection against vandalism
- economic and engineering feasibility of reconstruction, restoration and maintenance
- representativeness and uniqueness of the site
- proximity to established recreation areas
- compatibility with surrounding zoning regulations or land use
- land ownership and administration
- local community attitude toward site preservation, development or destruction

- present use of site
- b) Does the site receive visitation or use by tourists, local residents or school groups?
 - o Other
 - Is the site a commonly acknowledged landmark?
 - Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
 - Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?
 - Is the site representative of a particular architectural style or pattern?

For each predicted impact, criteria are described. These criteria include the **magnitude** (size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale), as well as the **probability** (likelihood). The methodology is quantitative and generated through a spreadsheet but requires professional judgement in the application of the criteria.

When assessing impacts, broader considerations are also considered, these include the **confidence** with which the assessment was undertaken, the **reversibility** of the impact and the resource **irreplaceability**.

Calculations

(as applied in the excel spreadsheet 'Kameelhoek Mine.xls') – Available on request.

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **magnitude** (size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (magnitude + duration + extent).

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

The following tables show the scales used to classify the above variables and define each of the rating categories.

5.1 Magnitude

The magnitude refers to the degree of alteration of the affected environmental receptor. The relevant descriptor for magnitude is selected by the user (refer to Table).

Table 3. Description of magnitude and assigned numerical values

Numerical Rating	Magnitude	
	Category	Descriptors
1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered

2	Very low	Natural and/ or social functions and/ or processes are slightly altered
3	Low	Natural and/ or social functions and/ or processes are somewhat altered
4	Moderate	Natural and/ or social functions and/ or processes are moderately altered
5	High	Natural and/ or social functions and/ or processes are notably altered
6	Very high	Natural and/ or social functions and/ or processes are majorly altered
7	Extremely high	Natural and/ or social functions and/ or processes are severely altered

*NOTE: Where applicable, the magnitude of the impact is related to a relevant standard or threshold or is based on specialist knowledge and understanding of that particular field.

5.2 Duration

The duration refers to the length of permanence of the impact on the environmental receptor. The relevant descriptor for duration is selected by the user (refer to Table).

Table 4. Description of duration and assigned numerical values

Numerical Rating	Duration	
	Category	Descriptors
1	Immediate	Impact will self-remedy immediately
2	Brief	Impact will not last longer than 1 year
3	Short term	Impact will last between 1 and 5 years
4	Medium term	Impact will last between 5 and 10 years
5	Long term	Impact will last between 10 and 15 years
6	On-going	Impact will last between 15 and 20 years
7	Permanent	Impact may be permanent, or in excess of 20 years

5.3 Extent

The extent refers to the geographical scale of impact on the environmental receptor. The relevant descriptor for extent is selected by the user (refer to Table).

Table 5. Description of extent and assigned numerical values

Numerical Rating	Extent	
	Category	Descriptors
1	Very limited	Impacts very limited / felt in isolated areas of the study area
2	Limited	Impacts limited to specific parts of the study area
3	Local	Impacts felt mostly throughout the study area

4	Municipal area	Impacts felt outside the study area, at a municipal level
5	Regional	Impacts felt outside the study area, at a regional / provincial level
6	National	Impacts felt outside the study area, at a national level
7	International	Impacts felt outside the study area, at an international level

5.4 Probability

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is also taken into account. (Refer to Table).

Table 6. Definition of probability ratings

Numerical Rating	Probability	
	Category	Descriptors
1	Highly unlikely / None	Expected never to happen
2	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
3	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
4	Probable	Has occurred here or elsewhere and could therefore occur
5	Likely	The impact may occur
6	Almost certain / Highly probable	It is most likely that the impact will occur
7	Certain / Definite	There are sound scientific reasons to expect that the impact will definitely occur

5.5 Significance

These are auto-calculated in the spreadsheet as described above and includes the following categories in Table 11. This table is for illustration only.

Table 7. Application of significance ratings

Range		Significance rating
-147	-109	Major (-)
-108	-73	Moderate (-)
-72	-36	Minor (-)
-35	-1	Negligible (-)
0	0	Neutral
1	35	Negligible (+)
36	72	Minor (+)

73	108	Moderate (+)
109	147	Major (+)

The following, broader considerations will also be considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Tables 12, 13 and 14 respectively.

Table 8. Definition of confidence ratings

Rating	Descriptor
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 9. Definition of reversibility ratings

Rating	Descriptor
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 10. Definition of irreplaceability ratings

Rating	Descriptor
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

5. Description of Affected Environment

5.1 Map of Key Features

No key features were identified within the study area.

5.2 Results of Fieldwork

The area was accessed by vehicle and investigated on foot. The area has been mostly disturbed from green field condition and is strongly associated with agriculture and rural living. The study area was found to be devoid of any heritage sites of significance. No signs of occupation, except for some Late Stone Age, banded iron stone, tools and flakes could be identified. The stone tools did not form part of a significant concentration and no signs, such as cores and flakes, could be found to indicate a manufacturing site.



Figure 8. Stone Tools *in situ*



Figure 9. Stone Tools *in situ*

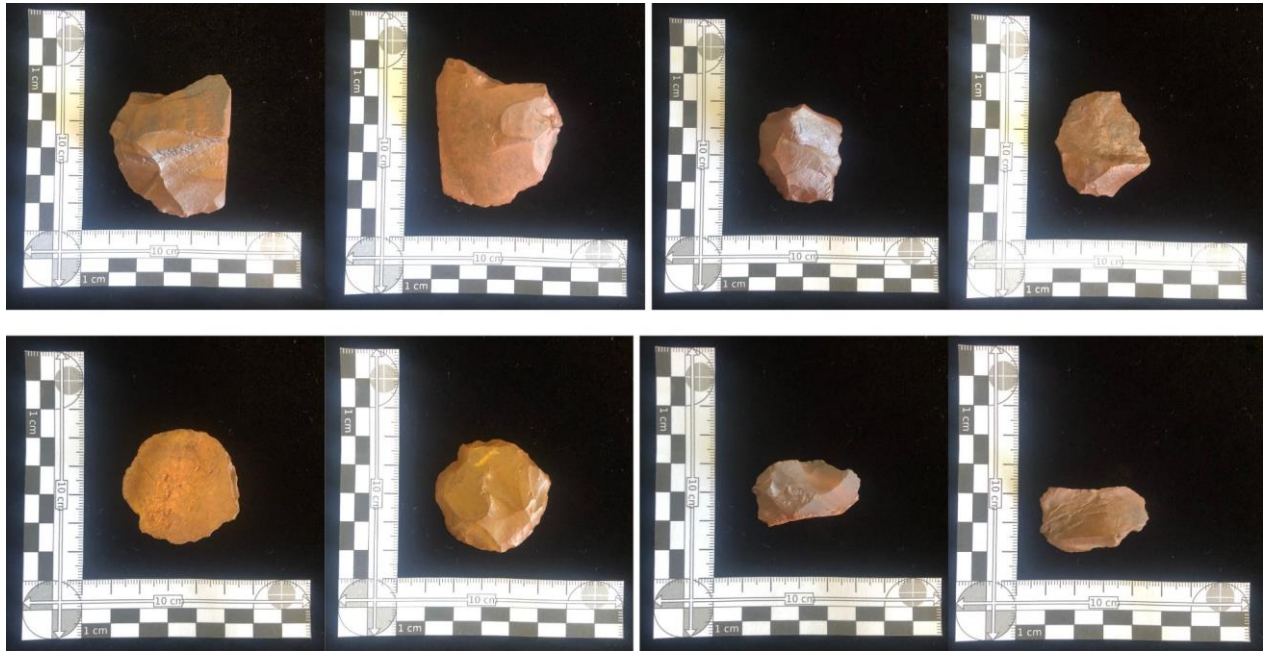


Figure 10. Stone Tools



Figure 11. Stone Tools

6. Baseline

Context Relevant to Project Location, Design, Operation, or Mitigation Decisions

For centuries, the area was used by hunter-gatherer groups (the San, or Bushmen). Archaeological research in the area of the Wonderwerk Cave reveals a long record of human and environmental history over thousands of years. The cave and its surroundings form a conservation area with featured distinctive of the Krurman Hills.

6.1 Palaeontology

Palaeontological remains occur in the Cretaceous layer underlying the study area. These are of high significance but should not be impacted on as the ground intrusion is very limited and bedrock is not expected to be disturbed. This is only a basic analysis of the palaeontology, and it is not a specialist analysis.

The SAHRIS *PalaeoSensitivity* Map places the site within multiple designations, namely red, orange, green and blue. On this basis a Field-based Palaeontological Impact Assessment is required. This PIA was performed by Dr Durant and is included at the end of this report.

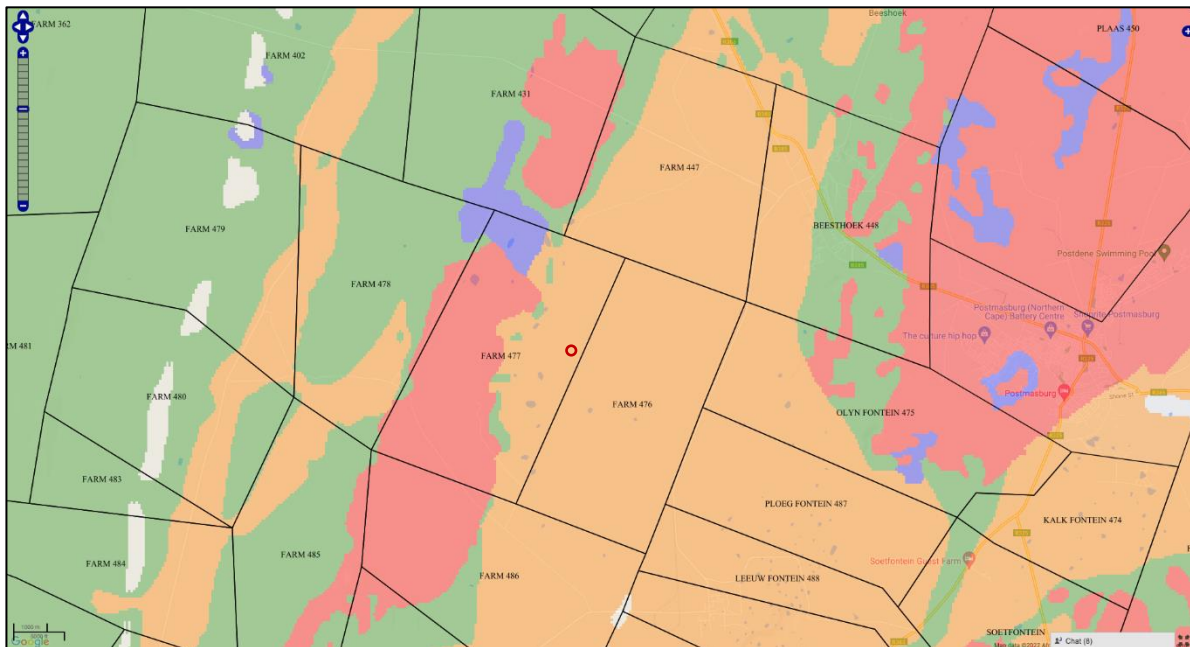


Figure 12. *PalaeoSensitivity* Map

Table 11. Palaeontological Sensitivity

Colour	Sensitivity	Action Required
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 area will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.
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Rose Prevec (2011) performed a specialist palaeontological impact assessment on the farm Kameelhoek 477 in 2011. Her recommendations for mitigation are reproduced below.

Since the same geological formations are found on the rest of Kameelhoek 477 as well as 478, the recommendations of the specialist report will be applicable.

“The 1:250 000 geological map of the Postmasburg district (1977) indicates the following strata exposed at surface within the property boundaries: Tertiary to Quaternary calcretes of the Kalahari Group(QI) – surface limestone (calcrete).” (Prevec, 2011)

Transvaal Supergroup (Late Archaean to Palaeoproterozoic)

Olifantshoek Sequence

Postmasberg Group

Vöelwater Formation (Vv)

Gamagara Formation (Vg)

Ghaap Group

Campbell Rand Subgroup

Ghaaplato Formation, Lime Acres Member (Vgl)

“Although not mapped at surface within the Kameelhoek 477 Remainder property, there is a possibility that (Karoo Supergroup) Dwyka Group (Mbizane Formation) or basal Ecca Group (Prince Albert Formation) deposits may be found at depth during future mining activity, as has been the case at Sishen mines to the north-east.” (Prevec, 2011)

(1:250 000 geological map, 2822; Moen, 1977; Council for Geoscience, Pretoria)

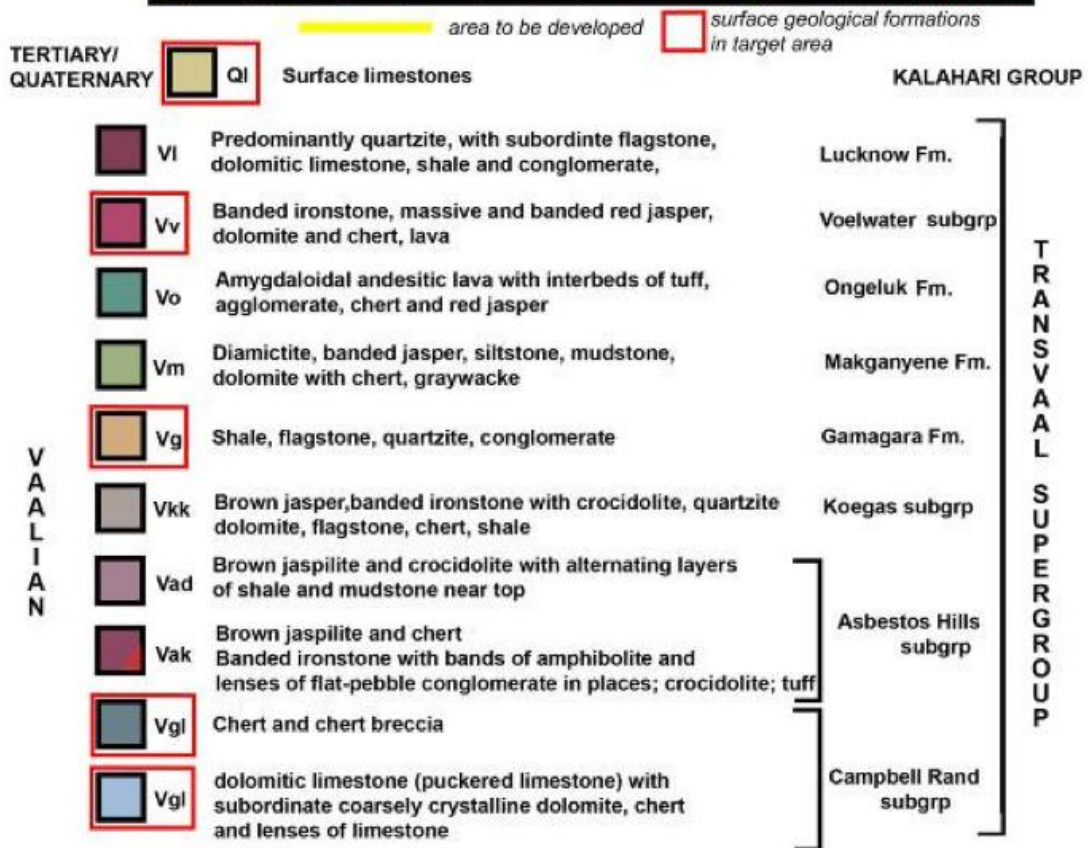
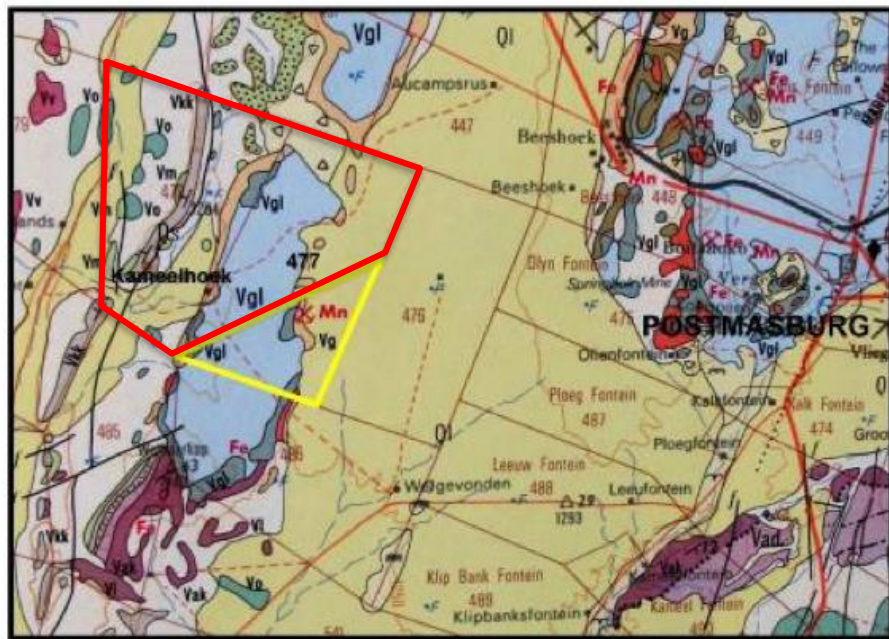


Figure 13. Geology map with study areas (current study area in red)

Mitigation

“Of the rock units likely to be encountered during mining activity on Kameelhoek 477 & 478, only the Dwyka Group and Eccca Group require any mitigation on behalf of the developers. Geological faulting and the patchy distribution of these deposits in the area make it difficult to predict the occurrence of the units. Fossils are relatively rare in these Formations (although locally they may be concentrated), but are of moderate to high palaeontological significance. If Dwyka or Eccca Group rocks are excavated, the Environmental Control Officer must be notified, so that regular surveys of the excavation may be conducted, and any exposed fossils can be appropriately protected and removed for curation.” (Prevec, 2011).

6.2 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, Middle Stone Age and Earlier Stone Age. Each of these phases contain sub-phases or industrial complexes, and within these we can expect regional variation regarding the 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. Recent to 30 000 years ago.
- Middle Stone Age: associated with Homo sapiens and archaic modern humans. 30 000 to 300 000 years ago.
- Earlier Stone Age: associated with early Homo groups such as Homo habilis and Homo erectus. 400 000 to 2 million years ago.

This area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are less common in this area, however rock-art sites and Late Stone Age sites are much better known (Clark 1959).

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods (Deacon 1984). This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades.

Specifically The Wonderwerk Cave in the Kururman hills has provided much Stone Age information (Beaumont 1984, 2006).

Specularite mining is noted by Beaumont and Bashier (1974) at Doornfontein and Blinkklipkop between 800AD – 820AD.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites.

6.3 Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both pre-historic and historic periods. It can be divided into three distinct periods:

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

The Iron Age prehistory of southern Africa has traditionally been divided into two periods, the Early Iron Age, and the Later Iron Age. Chronologically, the division was put at the year 1000. Culturally, it was based on

several changes' observable in the archaeological record, including economic, social, and political organization. Because of this, the two periods were seen as bracketing separate cultural phenomenon and interpreted as reflecting new population movements into southern Africa from the north.

Although there is documentary evidence of a large Iron Age Tswana village – Dithakong, located in the general area of the site the occurrence of this is still hotly contested and the findings of Cobbing have been largely discredited (Cobbing 1988, SAHRA ARC pers. comm).

More recent research by Jacobs shows occupational Tswana sites to occur during the later “Bantu Expansion” and “Proto-Difiqane between c1750 and 1830 in the study area. Specifically the Tlhaping and Tlharo chiefdoms are referred to here (N. J. Jacobs, 199). It is even suggested that some Sotho-Tswana people might have preceded the Tlhaping and Tlharo in this region. This is however not a recent postulations since Ellenberger and MacGregor already proposed earlier Iron Age communities in these areas as early as 1912 (Ellenberger & MacGregor, 1912).

Tswana Industry groups might have continued the specularite mining noted in the Stone Age during the Iron Age in this area from 1600 on.

According to Breutz (1963) Iron Age settlements could be found as far south as Gatlhose and Majeng, which are both within 25km of the study area. Such sites have also been identified at Daniëlskuil (Snyman, 1986). These groups were eventually driven from the area by the Kora (Snyman, 1986).

6.4 Historic Era

For about two decades, after 1770, the area was turbulent with wars and raiding clans. In the Ghaap region, the Khoi were called the “Korana” and one of these clans, the Springboks, were led by a fearsome white brigand, namely Jan Bloem, who was based near the current day Postmasburg. Bloem was eventually defeated by a Tswana clan.

In the 1700's the area fell under the control of two Tswana groups; the BaTlharo and the BaTlhaping, in an area that stretched from Campbell in the east, across Daniëlskuil and Postmasburg, up to the Langeberge at Olifantshoek in the west. The region was then called Tlakalatlou (seTswana for “elephant's reed”) – possibly reflecting the times when elephants were hunted in the reedy wetland at Daniëlskuil.

The Griquas were a rich mixture of racial groups. The Cape Colonial Government recognised their leaders of chiefs. In 1804, the Griquas established a town named “Klaarwater”, the present day Griekwastad. The Griquas under the leader Barend Barends moved to Daniëlskuil in 1820 – much to the dismay of the local San people, who resisted the Griquas by ambushing them in the veld and stealing their livestock. The San often hid their loot at Boesmanggat, a cave located on the Farm Mount Carmel, approximately 40km north of Daniëlskuil.

The area of Postmasburg was originally known only for the site of Blinkklipkop where the pre-colonial specularite mines were located. The site at Blinkklipkop was successively occupied by vagrants to explorers (often the same category during this time) and Carl Lichtenstein gives colourful descriptions of this site during his visit of 1805 (Lichtenstein 1930).

The Blinkklipkop (Blinkklip) site researched by Thackeray and Beaumont in the 1980's, could also be identified from sketches and descriptions by Burchell documented during his 1813 expedition through the area (Thackeray, 1983).

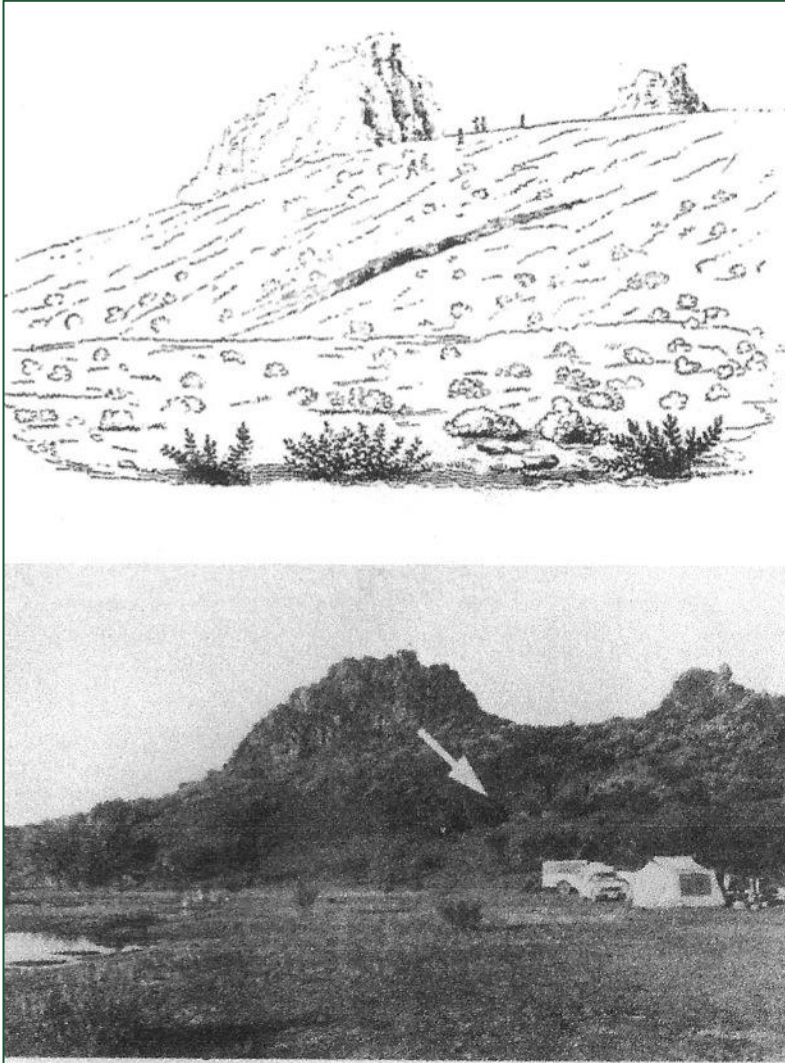
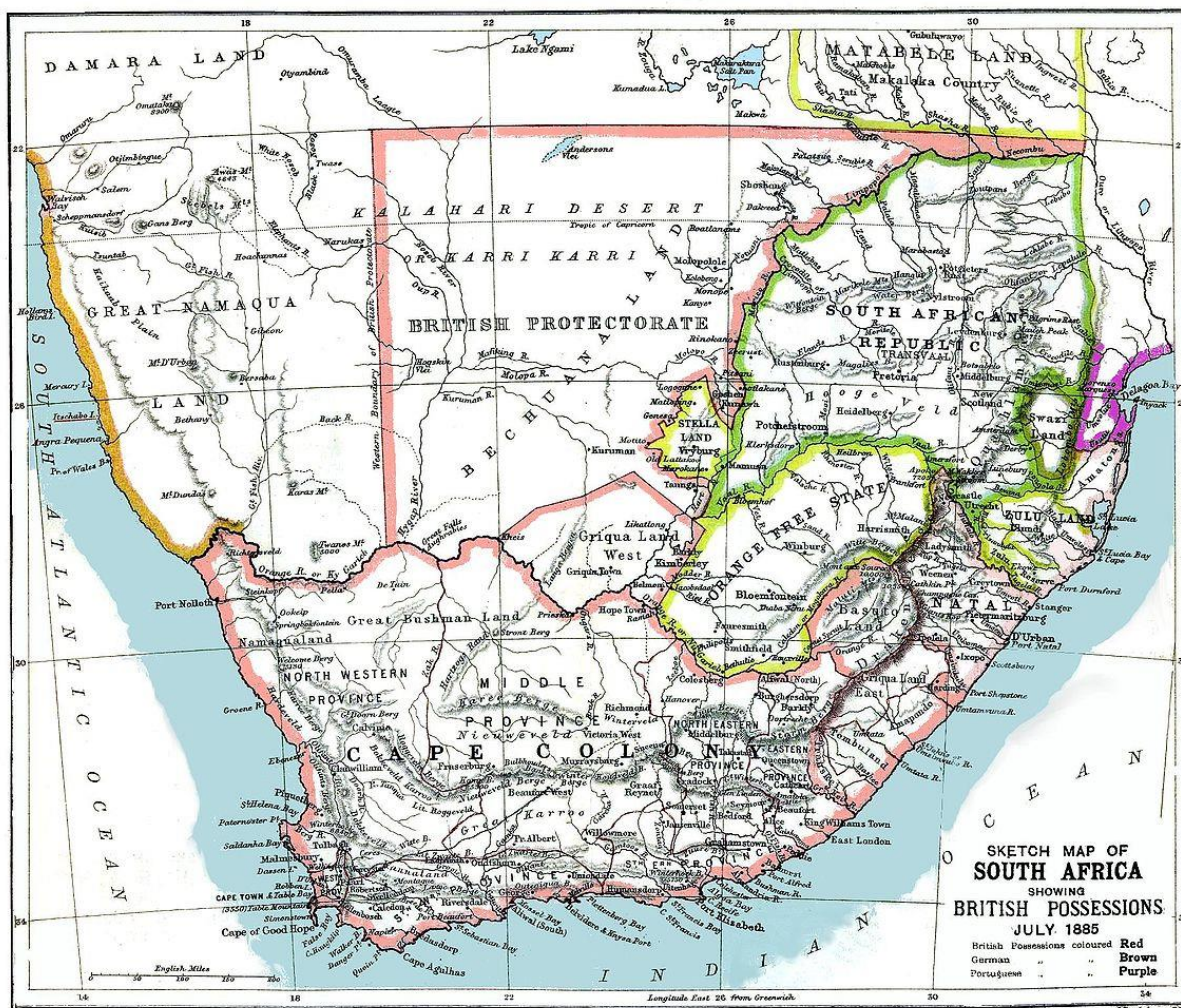


Figure 14. Sketch by Burchell compared by Thakeray (Thakeray, Thackeray & Beaumont, 1983)

By 1820 the Griqua was settling in the Blinkklipkop area (Legassick, 2010) to be followed by the Thlaro group under Isaak Thupane who settled close to present day Postmasburg (Breutz 1963). During the 1860's diamonds were discovered in the area leading to the British annexation of Griqualand in 1871 and the renaming as *Griqua Land West* (Legassick, 2010).



Scottish Geographical Magazine, 1885.

Figure 15. Historic map showing Griqua Land West (Scottish Geographic Magazine, 1885)

After 1800 the Cape Government sent scouting parties out to the area. The Griqua Leader, Willem Visser settled on Blinkklipkop and it became a permanent Griqua outpost. The London Mission Society started a mission station, named Sibling, on Blinkklip in 1833.

The British government took over Griqualand West in 1871 and on 14 April 1892 the name of the town was changed to Postmasburg in honour of Reverend Dirk Postma, one of the founding members of the Dutch Reformed Church. The town was officially founded in 1893.

The Gouws family acquired the farm Kameelhoek (study area) in the Postmasburg region on 21 February 1885 and built the first farmhouse in 1890. The building still remains and is still lived in. (See figure 12: original Farmhouse). The same family remained on the farm until it was purchased by Anglo-American Mining, stretching over 5 generations, although they are now named Erasmus (passing from father to daughter).

With the outbreak of war between the British and the Boer Republics on 11 October 1899, this area was annexed by Boer Commandoes and was held for the next eight months. By March 1900 the whole Griqua Land West was under the control of Boer commander P J de Villiers.



Figure 16. Cmdr. PJ de Villiers

On the 30th of March 1900 E.M. Warden was appointed as the Magistrate of Postmasburg, with G.H.J. van der Walt as his assistant.

The Postmasburg Boer soldiers stationed themselves at Campbell to secure the position against an attack by the British. Sir Alfred Miller anticipated the danger from these soldiers and gave Sir Charles Warren an order to besiege Griqualand-West. On the 30th of May 1900 the Boer soldiers attacked Warren's troops. The attack was unsuccessful and after fifteen British soldiers and 30 Boer soldiers were killed, the Boer troops retreated.

After this battle, Colonel S. Hughes marched up against all the towns in Griqualand West, including Postmasburg and conquered the area. G.H.J. van der Walt handed over the keys to the government offices to J.D. Aucamp and turned himself in. After a failed petition attempt to escape persecution, all Boer soldiers who held a rank were put in prison in Griquastad.

For nearly a year there were no military operations and most of the Boer soldiers were set free with parole and were allowed to return to their farms.

In June 1901 the Boer commandos would rise up again and intercepted a post-cart between Postmasburg and Floradale. Within a few weeks of this incident, General De Villiers invaded the area a second time to serve as a link between General De La Rey in the Western Transvaal and General J.C. Smit in the Northern Cape. Postmasburg was once again under the Boer's control when Commandant Edwin Conroy occupied the Government Offices, Police Station and Post Office on the 10th of August 1901.

During the battle of Rooikoppies, on 24 August 1901, twelve British soldiers were killed.

When the Boer Republics surrendered in May 1902, control of Griqualand West was returned to the British (Strydom 1937).

Postmasburg achieved municipal status in 1936.

From 1918 onwards the area was known for diamond mines focussed on kimberlite pipes. Until its closure in 1930, the West End Diamond Mine near Postmasburg produced more than 180 000 carats of diamonds (Snyman, 1977).

The Beeshoek Mine was originally a manganese mine that started operating in 1935. The scope of the iron-ore deposits in the area was realized in the 1940's. Exploration followed and in the late 1950's the mine switched its operations to produce iron-ore. The mine continued its operations (primitively hand sorting) until when in 1975 a full washing and screening plant was installed. Beeshoek was closed in 1981, but reopened in 1985 and graduated their operations with new extensions in 1999.

Sources:

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<https://register.nbkb.org.za/sites/heritage-sites/>
<https://www.southafrica.net/gl/en/travel/article/the-battlefields-route-northern-cape>
www.southafrica.org.za/south-africa-travel-postmasburg.html
www.greenkalahari.co.za/index.php/postmasburg
www.sa.venues.com/attractionsnv/postmasburg.php
www.minigweekly.com/article/beeshoek-ironore-mine-2005-08-05
www.samilitaryhistory.org/vol066ps.html

6.5 Archival Research

Three main sources of information regarding the heritage sensitivity of this area could be identified. These were;

- Scientific publications on heritage related research in the area
- Previous heritage studies in the area as per the SAHRIS database
- Historic maps and figures as available in the National Archive

Scientific publications

Several publications on heritage related work in this area could be sourced. These include, but are not limited to;

- Beaumont, P.B. and Boshier A.K. (1974). *Report on Test Excavations in a Prehistoric Pigment Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol.29, No 113/114 (Jun., 1974), pp. 41 – 59.
- Humphreys, A.J.B. *Note on the Southern Limits of Iron Age Settlement in the Northern Cape*. The South African Archaeological Bulletin, Vol 31, No. 121/122 (jun., 1976), pp. 54-57.
- Thackeray, A.I., Thackeray J.F., Beaumont, P.B. *Excavations at the Blinkklikop Specularite Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol. 38, No. 137 (Jun., 1983), pp. 17-25.
- Forssman, T.R., Kuman, K, Leader, G.M., Gibbon, R.J. *A Later Stone Age Assemblage from Canteen Kopje, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 204-214.
- Couzens, R., Sadr, K. *Rippled Ware at Blinklipkop, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 196 – 203.
- Rudner, J., Rudner, I. *Rock-Art in the Thirstland Areas*. The South African Archaeological Bulletin, Vol.23, No. 91 (Dec., 1968), pp. 75-89.
- Humphreys, A.J.B., *Cultural Material from Burials on the Farm St. Cair, Douglas Area, Northern Cape*. The South African Archaeological Bulletin, Vol 37, No. 136 (Dec., 1982), pp. 68-70.

The literature study of the above publications resulted in several findings that guided investigations regarding the site at Kameelhoek 477 & 478; The main points are;

- The identification of five pre-colonial specularite mines in the immediate vicinity of Postmasburg as identified by P.B. Beaumont and A.K. Boshier. These are as follows;
 1. Doornfontein – This is a site with a maximum length of 100m consisting of four chambers from which at least an estimated 45 000 metric tons of specularite was removed (Beaumont & Boshier, 1974). Although the specularite mining is discussed in detail there is however no discussion on the reasons for these large scale excavation. It is clear that the workings were that of Stone Age peoples and since specularite does not deliver good material for stone tool manufacture it begs the question why these extensive excavations exist in the first place.

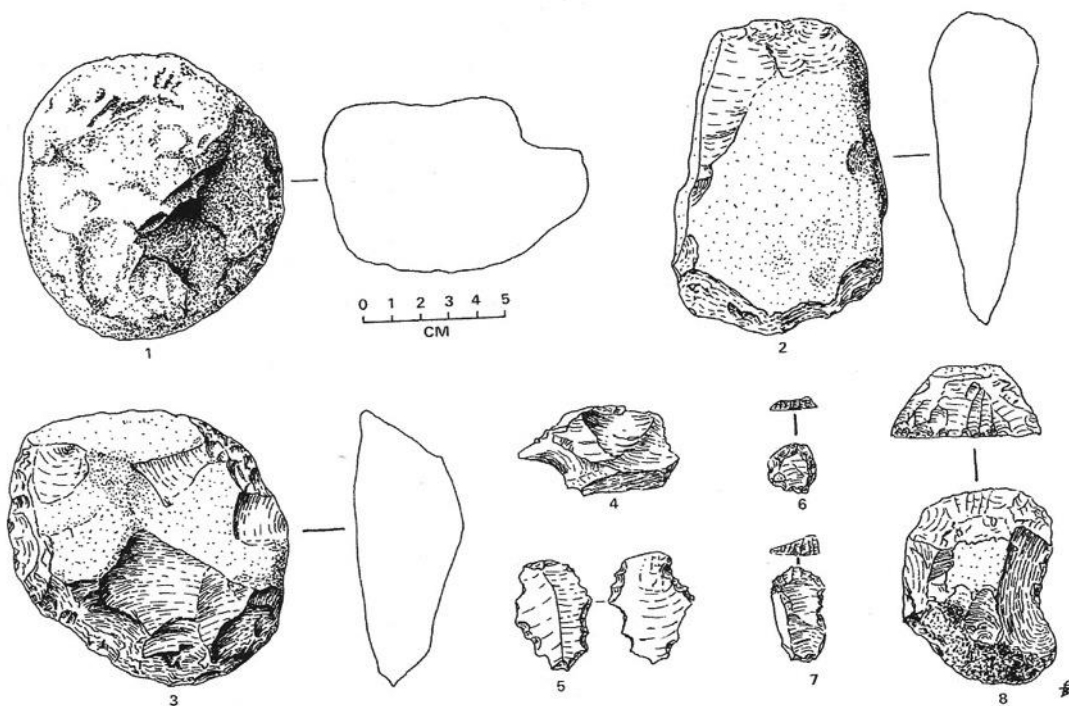


Figure 18. Stone Tools from Doornfontein (Beaumont and Boshier, 1974)

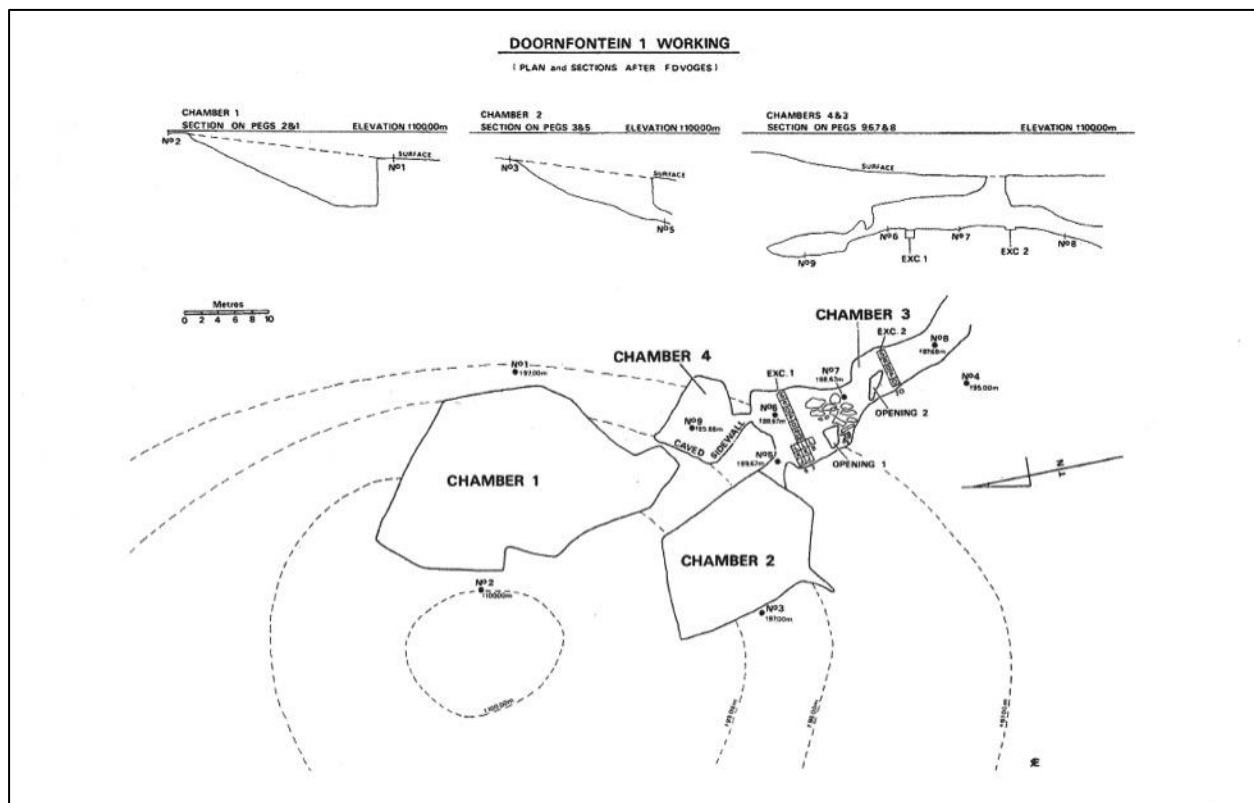


Figure 19. Layout figure for Doornfontein (Beaumont & Boshier, 1974)

2. Blinkklikop – This is another pre-colonial specularite mine on a hill known as Blinkklikop or Gatkoppies, 5km north-east of Postmasburg. In this analysis the authors gives a much more detailed description of the use of specularite as a decorative element for body decoration or

even pottery decoration. Further examples of specularite use is also described in Burchell (1822-4), Cumming (1850 I:232), Livingstone (1858), Borchers (1861 : 73-4) and Stow (1905 : 436) (Thackeray, Thackeray & Beaumont, 1983). The size and extent of deposits at Blinkklipkop makes this probably the most important of the five sites.

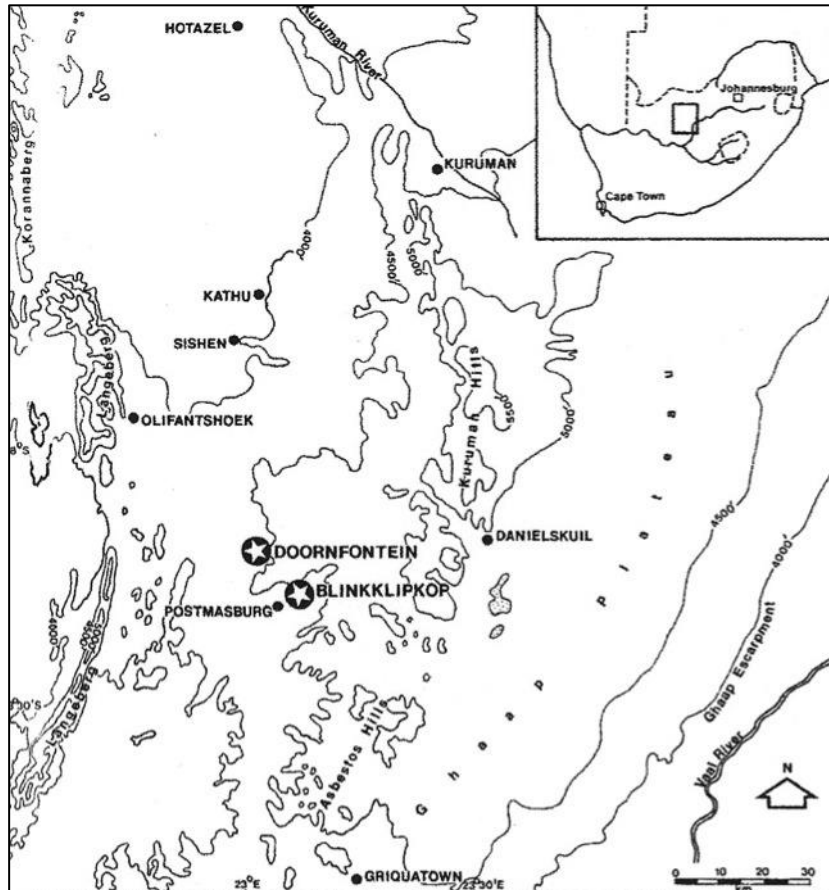


Figure 20. Location of pre-colonial specularite mines (Thackeray, Thackeray & Beaumont, 1983)

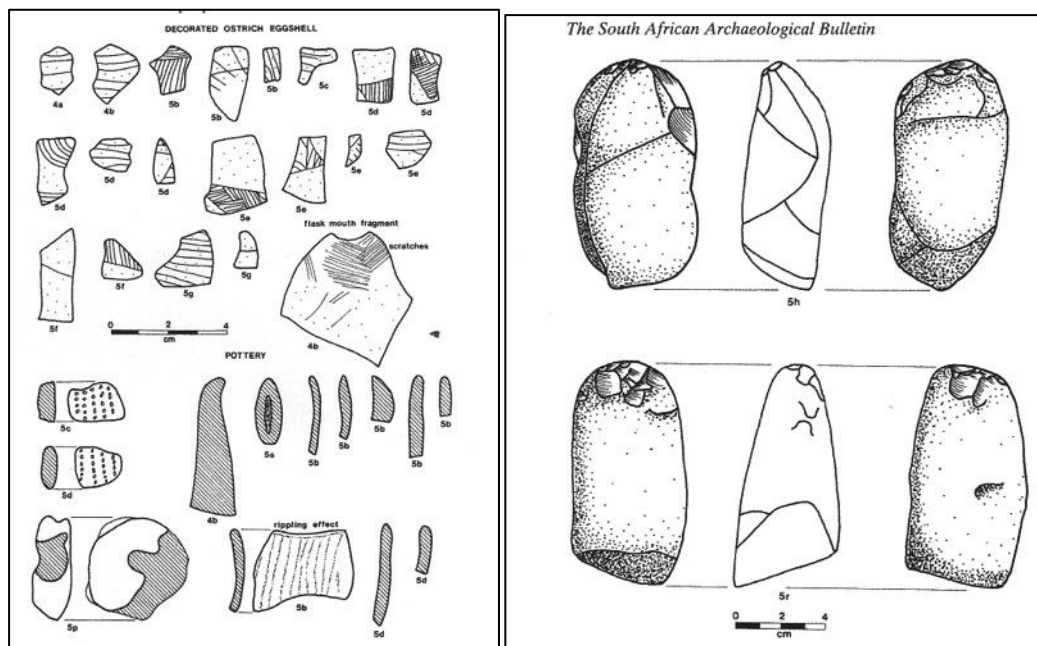


Figure 21. Decorated OEG and mining tools from Blinkklipkop (Thackeray, Thackeray & Beaumont, 1983)

3. Paling – Another large concentration of specularite is located on the farm Paling M87, 16km northwest of Postmasburg. The author does not indicate the extent of pre-colonial mining that actually took place here (Thackeray, Thackeray & Beaumont, 1983) .
 4. Gloucester – A pre-colonial specularite mine is found on the farm Gloucester, 13,24km north of Postmasburg. Only mining pits are observed here (Thackeray, Thackeray & Beaumont, 1983).
 5. Huxley – The final documented occurrence of specularite mining is on the farm Huxley, 15,30km north of Potsmasburg. Only mining pits located at this site (Thackeray, Thackeray & Beaumont, 1983).
- The identification of petroglyphs of elephant, kudu, ostrich, etc. on the farm Beeshoek. Some geometric symbols similar to *Late Red Art* is also identified here by Judner in 1968 (Judner & Judner, 1969).
 - Petroglyphs are also identified at Koegrabie on the farm Eindgoed (Rudner & Rudner, 1968).

6.6 SAHRIS Database Studies

An extensive search into the SAHRIS database resulted in the identification of the following heritage related studies that have been performed over the last two decades in the study area. Only studies within a radius of 50km from the study area were considered.

- Gaigher, S. 2015. Heritage Impact Scoping Report for the Mining Rights Application for the Remaining Portions of the Farm Kameelhoek 477 & 478 near the town of Postmasburg in the Northern Cape Province.
- Gaigher, S. 2016. Heritage Impact Assessment Scoping Report for the Mining Rights Application: Remaining Extent of the Farm Kameelhoek 477 near the town of Postmasburg in the Northern Cape Province.
- Beaumont P.B., 2012. CONSULTATION IN TERMS OF SECTION 40 OF MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT 2002, (ACT 28 OF 2002) IN RESPECT OF SAND FOR THE APPROVAL OF AN ENVIRONMENTAL MANAGEMENT PLAN FOR A MINING PERMIT ON A PORTION OF THE FARM FULLER NO.578, SITUATED IN THE MAGISTERIAL DISTRICT OF SIYANDA, NORTHERN CAPE REGION.
- Beaumont, P.B., 2007. PHASE 1 HERITAGE IMPACT ASSESSMENT REPORT ON THE FARM PORTIONS POTENTIALLY AFFECTED BY A PROPOSED DIRECT RAIL LINK

- BETWEEN THE SISHEN SOUTH MINE NEAR POSTMASBURG AND THE SISHEN-SALDHANA LINE, SIYANDA DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE.
- Fourie, W., 2013. Heritage Impact Assessment for the Humansrus Solar Thermal Energy Power Plant, Postmasburg.
 - Pelser, A., 2012. A REPORT ON AN ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) FOR THE PROPOSED BOICHOKO TOWNSHIP DEVELOPMENT ON PORTIONS 11 & 12 OF PENS FONTEIN 449, POSTMASBURG, NORTHERN CAPE PROVINCE.
 - Fourie, W., 2012. 132 kV Power line connection to the Humasrus Solar Thermal Energy Power plant, Postmasburg.
 - Orton, J., 2014. SCOPING HERITAGE IMPACT ASSESSMENT FOR PROPOSED PROSPECTING ON FARMS 53, 56, 566 AND 567, HAY MAGISTERIAL DISTRICT, NORTHERN CAPE.
 - Morris, D., 2013. Archaeological and heritage phase 1 predictive impact assessment for prospecting on Magoloring portions 4 and 5 (Japies Rust), near Glosam, Northern Cape Province.
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 - Becker, E., 2012. Proposed Skeifontein PV power plant and power lines, near Postmasburg, Northern Cape.
 - Beaumont, P.B., 2008. Phase 1 Archaeological Impact Assessment Report on Three Portions of the Farm Lohatla 673 North of Postmasburg, Siyanda District Municipality, Northern Cape Province.
 - Beaumont, P.B., 2011. Baseline Archaeological Reconnaissance Report on the Farm Lomoteng 669, North of Postmasburg in the Siyanda District Municipality of the Northern Cape Province.
 - Kusel, U., 2011. Heritage Management Plan for Kolomela Mine In the Postmasburg District Municipality of the Northern Cape Province.
 - Birkholtz, P.D., 2014. Coza Iron Ore Project: Heritage Impact Assessment on sections of Portion 1 of the farm Doornpan 445, north of Postmasburg, Northern Cape Province.
 - Pelser, A., 2012. A 2ND REPORT ON A HERITAGE IMPACT ASSESSMENT FOR THE UPGRADE OF TRANSNET'S GLOSAM SIDING FOR PMG'S BISHOP MINE (LOADING BAY) ON PORTION 2 AND THE REMAINDER OF GLOUCESTER 674 NEAR POSTMASBURG, TSANTSABANE LOCAL MUNICIPALITY, NORTHERN CAPE.
 - Beaumont, P.B., 2007. Phase 1 Heritage Assessment Report on the Farm Makganyene 667, Between Postmasburg and Olifantshoek, Siyanda District Municipality, Northern Cape Province.
 - Beaumont, P.B., 1998. Action Plan: Engraving Site on the Farm Beeshoek 448, Postmasburg District, Northern Cape.
 - Van Vollenhoven, A., 2012. A REPORT ON THE HERITAGE RELATING TO THE CLOSURE EMP OF THE ASSMANG GLOSUM MINE CLOSE TO POSTMASBURG , NORTHERN CAPE.
 - Webley, L. & Halkett, D., 2012. ARCHAEOLOGICAL IMPACT ASSESSMENT: PROPOSED PROSPECTING ON THE FARM DRIEHOEKSPAN 435, POSTMASBURG, NORTHERN CAPE.
 - Webley, L. & Halkett, D., 2010. ARCHAEOLOGICAL IMPACT ASSESSMENT: PROPOSED PROSPECTING ON THE FARM JENKINS 562 (EAST), POSTMASBURG, NORTHERN CAPE.
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ON PORTION 2 AND THE REMAINDER OF GLOUCESTER 674 NEAR POSTMASBURG, TSANTSABANE LOCAL MUNICIPALITY, NORTHERN CAPE.

- Van der Ryst, M., 2011. Specialist report on the Stone Age and other heritage resources at Kolomela, Postmasburg, Northern Cape.
- Kusel, U., 2013. Phase I AIA report on archaeological contexts and heritage resources on the farms Heuningkranz 364 and Langverwacht 432 in the Postmasburg District Municipality of the Northern Cape Province.
- Van Vollenhoven, A., A Report on a Heritage Impact Assessment Study for Proposed Mining Development on the Remaining Extent and Portions 2, 3, 4 and 5 of Kapstewel, Kuruman Registration District, Siyanda District Municipality, Northern Cape Province.
- Van Vollenhoven, A.C., 2009. AIA for the Proposed Mining Activities at Kareepan.

Relevance of Listed Heritage Studies for the Study Area

Of specific value for this project is the 2015 and 2016 reports from S. Gaigher: "Heritage Impact Scoping Report for the Mining Rights Application for the Remaining Portions of the Farm Kameelhoek 477 & 478 near the town of Postmasburg in the Northern Cape Province". These studies were based on the same property and the reports highlighted sites of heritage significance as listed below.

The majority of the study area is flat low-lying Kalahari bush and dunes. During the survey it was found that Late Stone Age (LSA) tools and flakes were found over large parts as isolated finds. During a 2011 study of a portion of the farm Kameelhoek 477, Anderson identified some 375 sites or finds while Webley & Halkett (2014) notes in a study on a site only 10km away the: "...almost total absence of (pre-colonial) archaeological material." This is a view shared by Morris (2005), based on his research in the area. It is therefore obvious that the definition of a "site" or "find" is still very arbitrary in this regard. Although I am not in a position to give clarity in this regard it is obvious that the listing of hundreds of individual locales in an attempt to populate the report is of no use. In this regard it was found more useful to identify areas of higher concentrations for preservation.

As in most areas of the Northern Cape Province, Iron Age sites are very limited and no such sites were identified here.

Historic sites are found in one concentration around the original farmhouse.

Site 1

GPS 28° 19' 41.6" S
22° 52' 49.1" E

This is the location of the old farmhouse and outbuildings as well as the labour houses. On the northern side of the homestead is the family graveyard.



Figure 22. The farmhouse in 1890 (Supplied by farm owner)



Figure 23. Present day farmhouse



Figure 24. Family graveyard at the farmhouse

The farmhouse was built in 1890. The farm has been in the same family since 1885 until it was bought by Anglo American recently.

Associated with the homestead and on the other side of the road is the labour quarters. It is not known what the exact age of these structures are, however their design suggests that they are significantly younger than the farmhouse and probably not older than 60 years. This was confirmed by historical aerial photography and topographical maps. A modern house was built by the owner further to the northwest. All of these structures will not be impacted by the proposed open pits with a 200m buffer zone applied to the historic farmhouse as well as the cemetery.



Figure 25. Labour housing

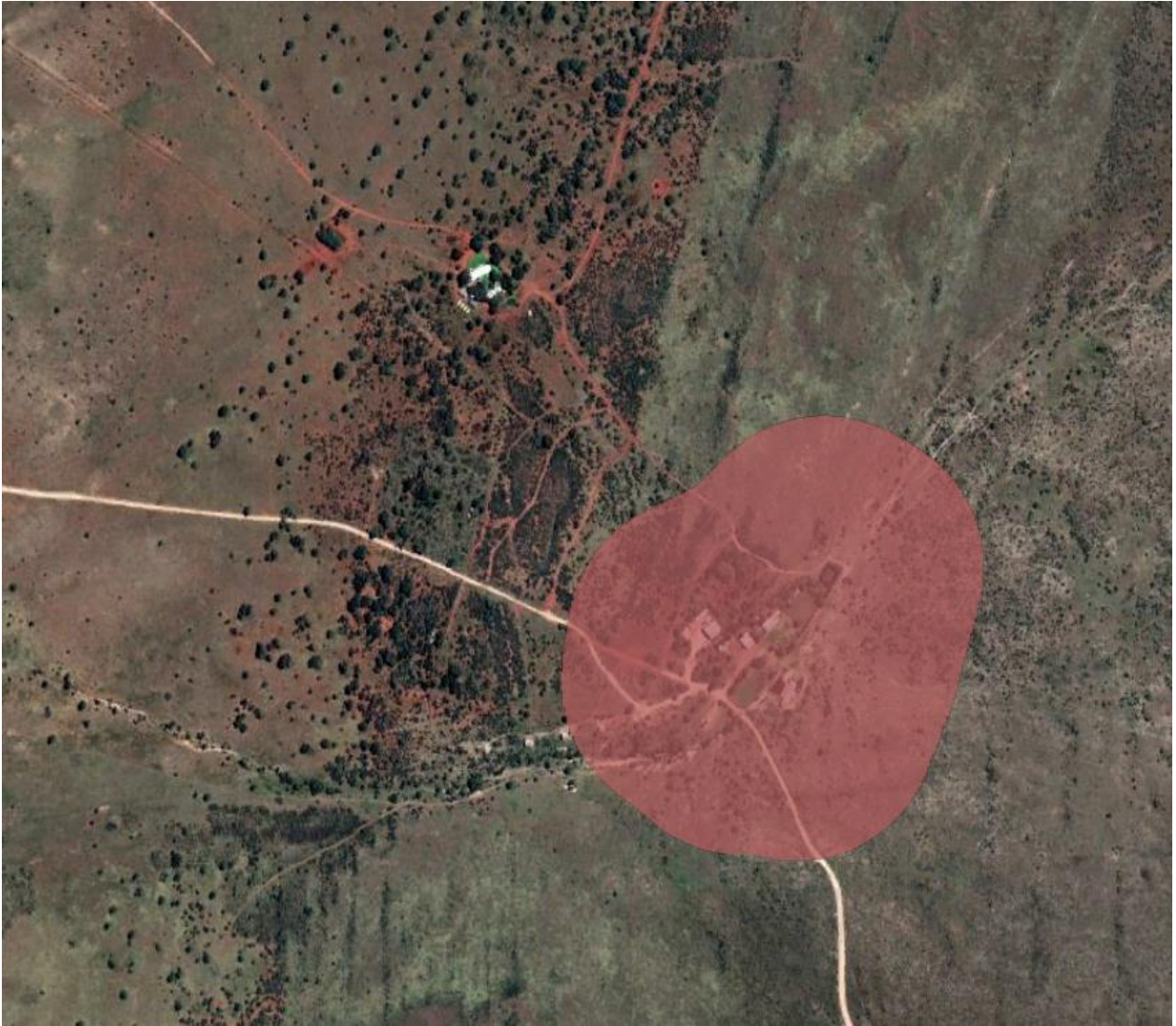


Figure 26. Exclusion zone for mining

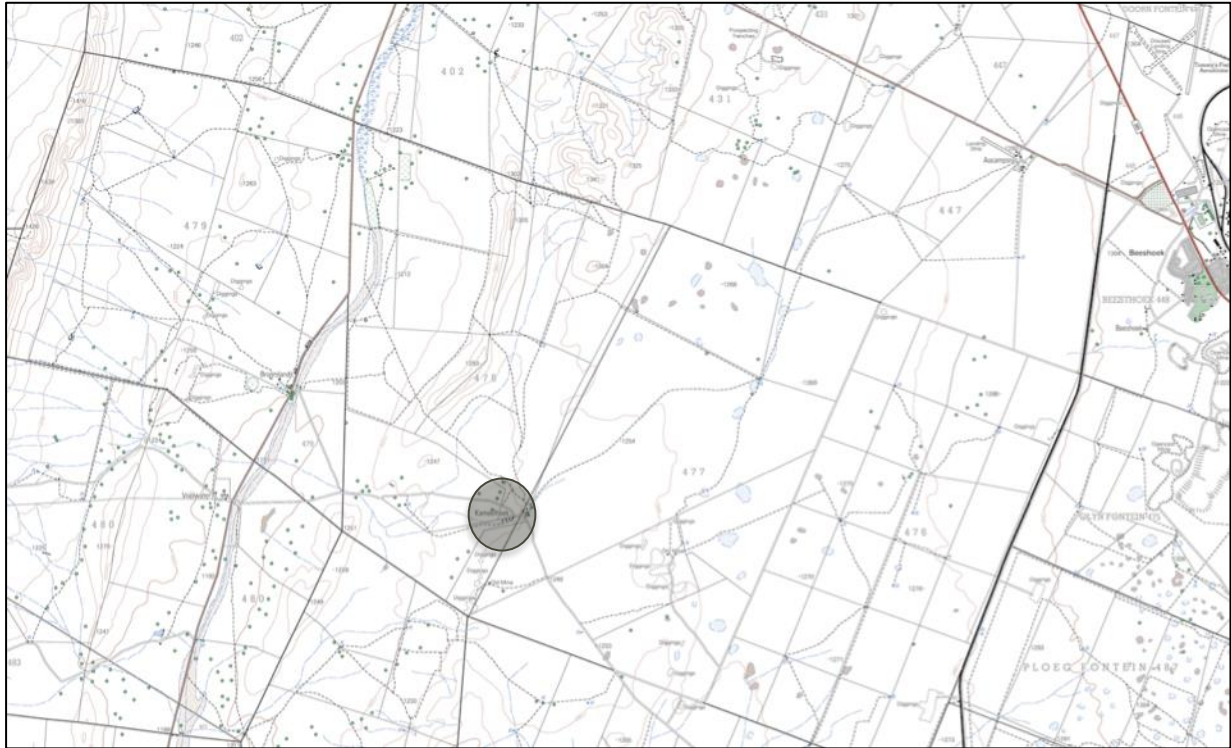


Figure 27. Mining exclusion general zone

Site 2

GPS 28° 17' 56.5" S
22° 55' 23.9" E

This is a site with unique Late Stone Age artifacts, Although the artifacts are widely distributed, the geographic suitability of the location suggests that this could well have been a manufacturing or seasonal site. It is located around a large non-perennial pan with the highest concentrations on the northern side of the pan. The identification of these high-risk areas is the focus of the current study. It is for this reason that the results below are only general results, as a more detailed analysis would become part of the Phase 2 Archaeological Impact Assessment. The aim of this survey is to note the locations of artefacts and assess them in terms of basic content and significance. Mostly Wilton and some pre-Wilton assemblages are found here.



Figure 28. Digging stone found at Site 002



Figure 29. Core found at Site 002



Figure 30. LSA Scrapers found at Site 002



Figure 31. Collection area for Site 002



Figure 32. Northern side of the pan at Site 002 showing LSA tools

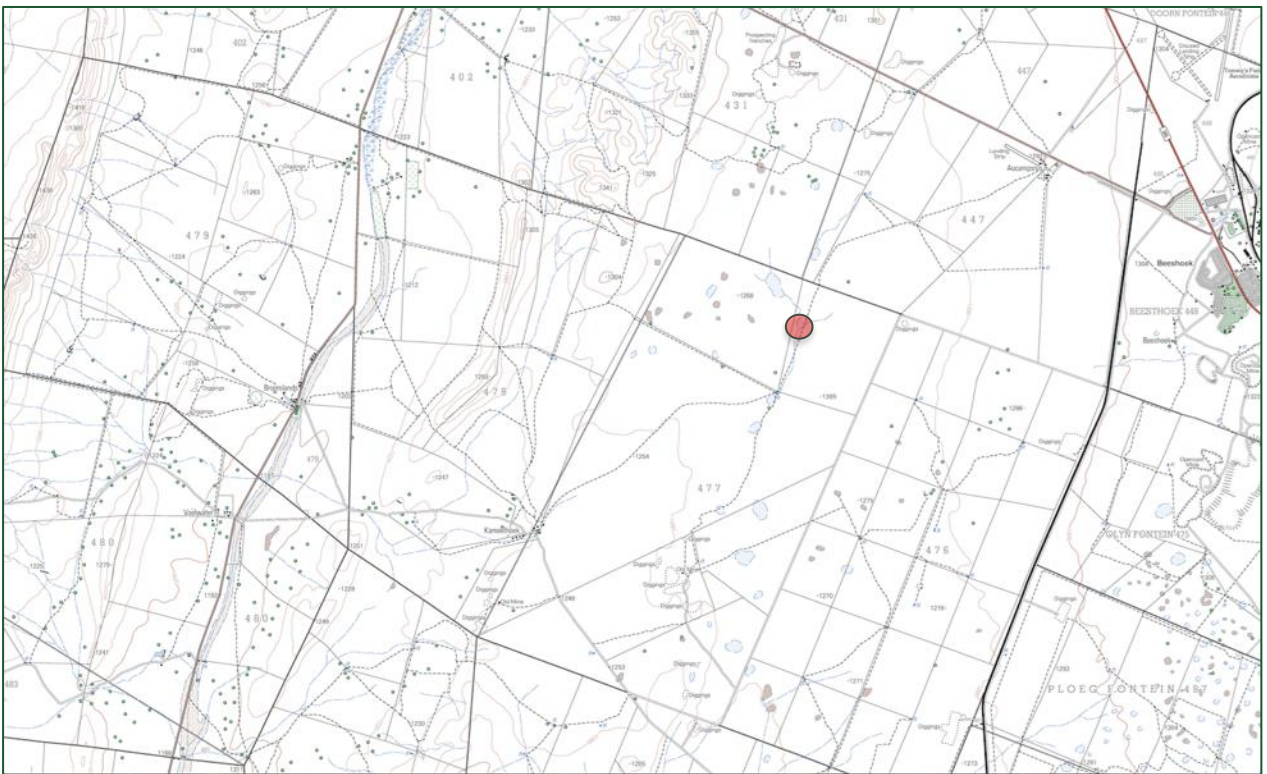


Figure 33. Location of Site 002

Site 3

GPS 28° 17' 34.6"
22° 55' 04.1"

This is another possible seasonal site located next to a non-perennial pan on the northern outskirts of the property.
LSA stone tools are found here.



Figure 34. LSA Tools in situ at Site 003



Figure 35. Location of Site 003



Figure 36. Concentration of LSA tools

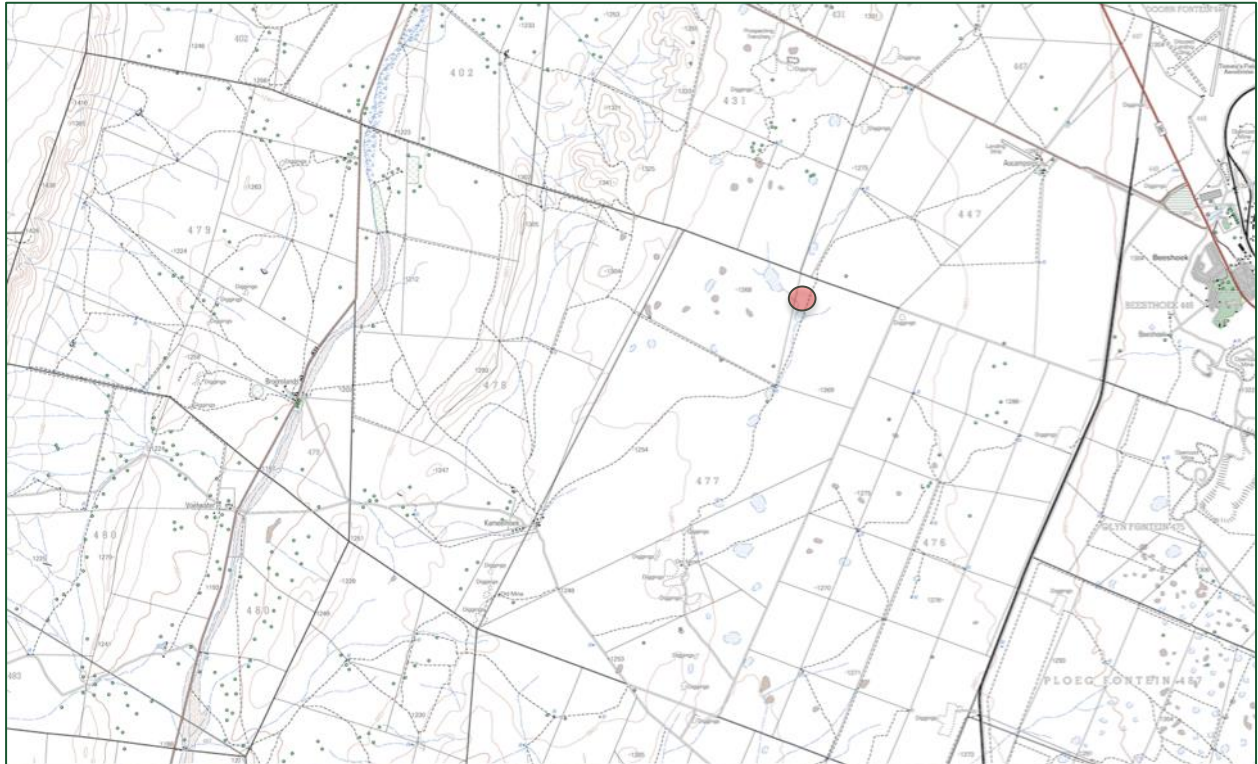


Figure 37. Location of Site 003

6.7 Historical Typographical Maps

Especially during the evaluation of historic structures, the availability of archived historic maps is useful. These give a direct chronological reference for such sites and lead the investigation on the ground.

Especially during the evaluation of historic structures, the use of archived historic maps is very handy. They give a direct chronological reference for such sites and also lead the investigation on the ground.

The following historic map sets are relevant for this study (in chronological order);

- Cape of Good Hope Reconnaissance Series – *Griquatown Sheet* (1914)
- Postmasburg Manganese Deposits, Geology Maps (1927 – 28)
- 2822 BD Topographic Sheet, First Edition Cadastral Survey (1971)

Significance of Scientific Information for the Study Area

The above information when analysed in detail forms a matrix within which the study area at Farm Kameelhoek no. 477, Portion 1 and the remainder of Farm 478 can be analysed, it furthermore also gives guidance to investigators to ensure that fieldwork is focussed on the possible occurrence of sites and features as outlined in these studies. The main points that have been derived from these studies are the possible occurrence of the following features within the study area;

- Possible pre-colonial specularite mining activities.
- Sites with petroglyph rock art.
- Sites with mining implements from the Stone Age
- Stone tool manufacturing sites

The following historic map sets are relevant for this study (in chronological order).

- 2822BD_1982.1
- 2822BD_1982.2
- 2822BD_2009.1

- 2822BD_2009.2

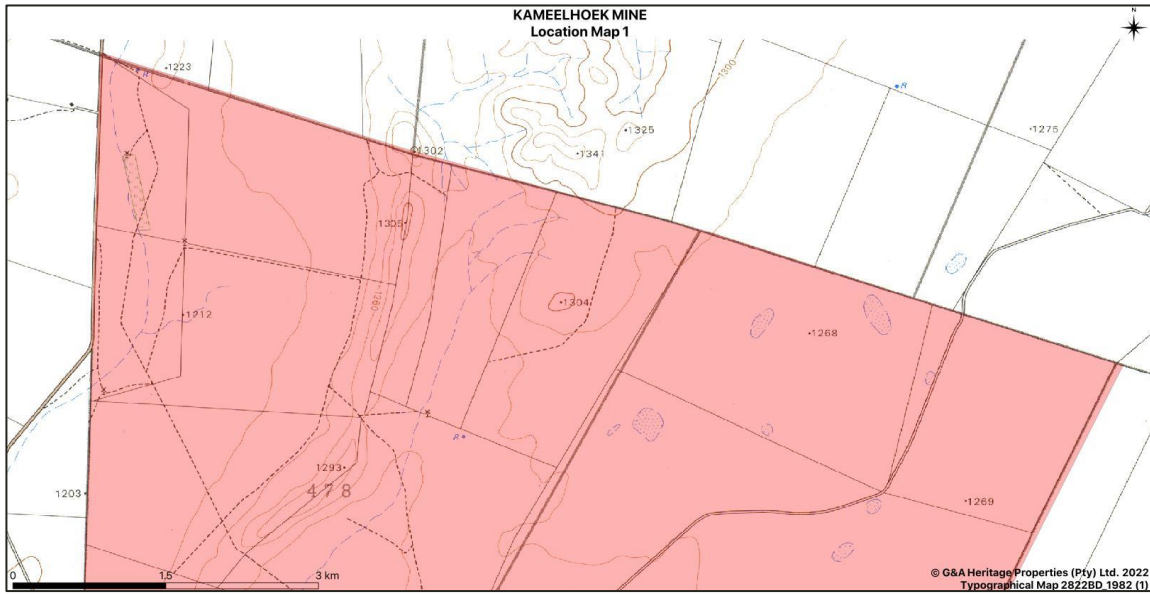


Figure 38. 2822BD_1982.1 Topographic Map

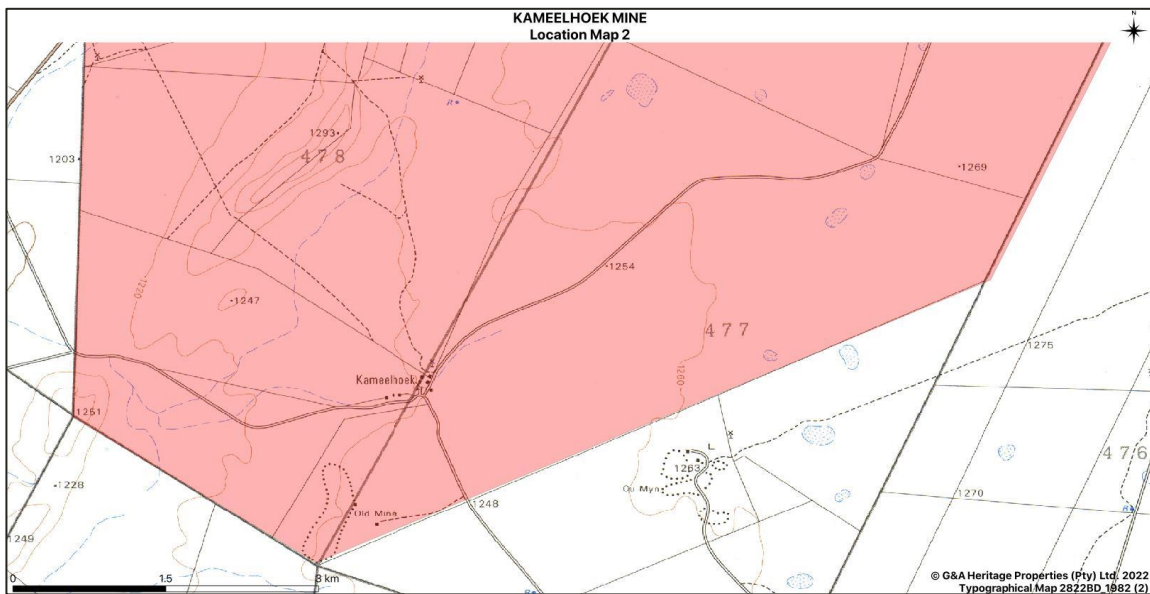


Figure 39. 2822BD_1982.2 Topographic Map

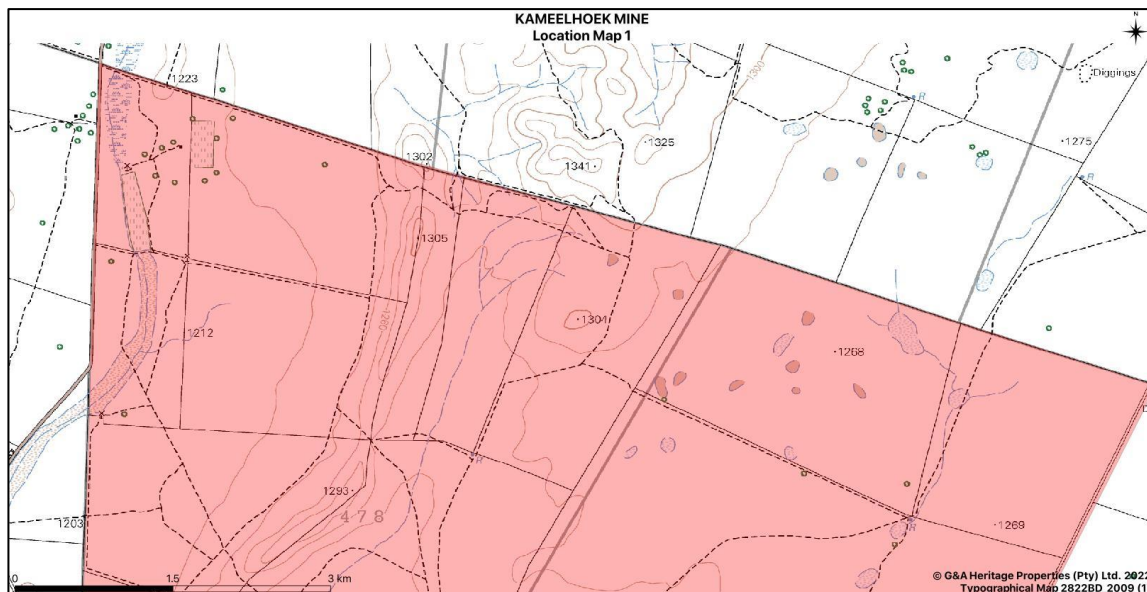


Figure 40. 2822BD_2009.1 Topographic Map

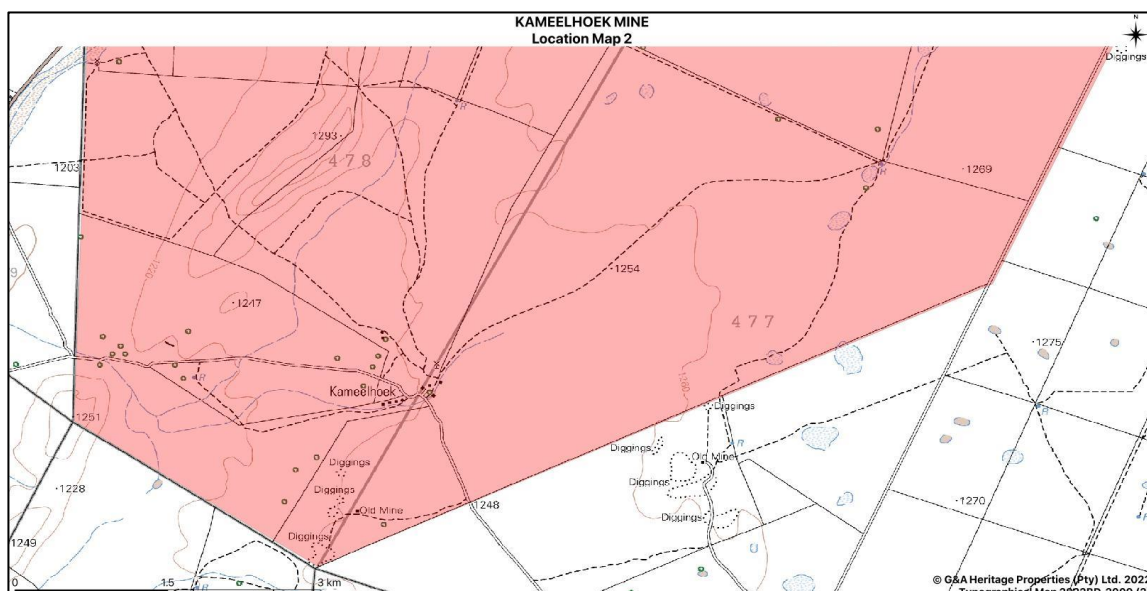


Figure 41. 2822BD_2009.2 Topographic Map

Relevance of Listed Heritage Studies for the Study Area

From the above it is obvious that the area around Postmasburg has been subject to extensive heritage investigations in the recent past. Although not all the reports were deemed to fulfil the minimum standards for heritage reports as outlined by SAHRA, the following guidelines could be extracted from them;

- Petroglyph sites seemed to be found primarily south and west of Postmasburg. There is a distinct lack of these sites to the north and this only changes once the area around Kathu is reached.
- Most specularite sites in the area around Postmasburg seemed to have been subjected to some sort of pre-colonial mining in the past. It is therefore imperative that any specularite deposits be investigated for such sites.
- The areas with high concentrations of magnetite and manganese does not seem to contain any Stone Age deposits with the exception of banded iron stone tools.
- Pans and rocky outcrops are high significance areas for finding heritage sites in this area.
- Some Stone Age shelters are found on rocky hills in the area.
- Anderson (2011) performed a heritage study on Portion 477 of Kameelhoek.

7. Potential Heritage Impacts and Proposed Mitigation

Heritage Impact Assessment

7.1 Introduction and scope

This component will evaluate the potential impact that the proposed development could have on heritage sites and objects of community, cultural or scientific value. This includes archaeological, cultural heritage, built heritage and basic palaeontological assessments to determine the impacts on heritage resources within the study area.

The scope of work includes:

- Identification and assessment of archaeological, cultural, historic, built, and palaeontological sites within the study area
- Archival study of existing data and information for the study area
- Site inspection and fieldwork: 29th March 2022. This site work includes communicating with local inhabitants to confirm possible locations of heritage and cultural sites.
- Compilation of a Heritage Impact Assessment (HIA) Report.

7.2 Impact Criteria

Consequence = ((Duration + Geographic Extent + Magnitude + Reversibility) X Nature)/4		
Environmental Risk = Consequence X Probability		
Priority factor = Public response + Cumulative impact + Irreplaceable loss of resources		
Impact significance = Priority factor X Environmental risk		
Geographic Extent: The physical and spatial scale of the impact (E)		
Activity	Limited to the area applicable to the specific activity	1
Site	Within the development property boundary	2
Local	Extends beyond the boundary of the site to adjacent areas, but effects occurring mainly within or in close proximity to the proposed development area	3
Regional	Effects extending outside of the project boundary to regional surroundings	4
Provincial / National / International	Effects extending outside of the regional surroundings and may have a provincial, national or international impact	5
Duration: The lifetime of the impact (D)		
Immediate	<1 year	1
Short term	1-5 years	2
Medium term	6-10 years	3
Long term	The impact will cease after the operational life span of the project	4
Permanent	The impact is expected to continue post-closure and no mitigation measure or natural process will remove the impact.	5
Magnitude: The intensity or amplitude of the impact on the socio-economic or		
Minor	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected (no associated consequences)	1
Low	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected	2
Moderate	The affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way	3
High	Natural, cultural or social functions or processes are altered to the extent that it will temporarily cease	4
Very high	Natural, cultural or social functions or processes are altered to the extent that it will permanently cease	5
Reversibility (R)		
With no time and cost	Impact is reversible without any time and cost	1
With little time and cost	Impact is reversible without incurring significant time and cost	2
With significant time and cost	Impact is reversible only by incurring significant time and cost	3
With prohibitively high time and cost	Impact is reversible only by incurring prohibitively high time and cost	4
Irreversible	Irreversible Impact	5
Nature (N)		
Negative	Likely to result in a negative/ detrimental impact	-1
Positive	Likely to result in a positive/ beneficial impact	1
Neutral	Not likely to have any beneficial or adverse impacts	0
Probability: This describes the likelihood of the impact occurring.		
Improbable	The possibility of the impact materializing is very low as a result of design, historic experience, or implementation of adequate corrective actions (<25%)	1
Low probability	There is a possibility that the impact will occur (>25% and <50%)	2
Medium probability	The impact may occur (>50% and <75%)	3
High probability	It is most likely that the impact will occur (- > 75% probability)	4
Definite	The impact will occur	5

Environmental risk rating:		
Low	Where this impact is unlikely to be a significant environmental risk	
Medium	Where the impact could have a significant environmental risk	
High	Where the impact will have a significant environmental risk	

Public response ("PR")		Rating
Low	Not raised as a concern by the I&AP's	1
Medium	Issue/ impact raised by the I&AP's	2
High	Significant and meaningful response from the I&AP's	3
Cumulative Impact ("CI")		
Low	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change	1
Medium	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change)	2
High	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is	3
Irreplaceable loss of resources ("LR")		
Low	The impact is unlikely to result in irreplaceable loss of resources	1
Medium	The impact may result in the irreplaceable loss of resources (cannot be replaced or substituted) but the value (services and/or functions) of these resources is limited	2
High	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions)	3
Impact Significance ("IS") rating		
Negligible	Impacts with little real effect. Will not have an influence on, or require modification of, the project design. Project/activity can be authorized with low risk of adverse environmental impacts.	
Low	Impact or benefit that requires management but that would not have a direct influence on the decision to develop in the area if it is mitigated. Project can be authorized but with conditions and routine inspections.	
Medium	Impact or benefit that could influence the decision about whether to proceed with the project. Project can be authorized but with strict conditions and high levels of compliance and enforcement. Monitoring and mitigation are essential.	
High	Where the impact must have an influence on the decision process to develop in the area. The risk/impact will result in an alteration to the environment even with the implementation of appropriate mitigation measures and will have an influence on decision-making. Strict conditions and high levels of compliance and enforcement will be essential as well as monitoring and mitigation.	
Confidence rating: Degree of confidence in predictions based on available information, professional judgment and/or specialist knowledge		
Low	Limited information is available and/or the understanding of the factors influencing the impact is scant.	
Medium	A reasonable amount of information is available and/or the understanding of the factors influencing the impact is relatively sound.	
High	A wealth of information is available and/or the understanding of the factors influencing the impact is sound.	
Mitigation Effect: Degree to which the impact can be managed following mitigation.		
Reversible	Can be avoided, managed or mitigated in such a way that natural processes or the social environment are not affected by negative impacts.	
Partly reversible	Can be avoided, managed or mitigated to the degree that natural processes or the social environment continue in a modified way.	
Irreversible	The impact may cause irreplaceable loss of resources. Functions or processes of the affected	
N/A	Not applicable	
Potential for residual risk		
Low		
Medium		
High		
Mitigation Type		
Avoidance/Prevention measure		
Control/reduction measure		
Enhancement		
N/A		
Remediation/ corrective measure		

Aspect	Description	Weight
Extent	Activity	1
	Site	2
	Local	3
	Regional	4
	Provincial, national, international	5
Duration	Immediate	1
	Short term	2
	Medium term	3
	Long term	4
	Permanent	5
Magnitude	Minor	1
	Low	2
	Moderate	3
	High	4
	Very high / don't know	5
Reversibility	With no time and cost	1
	With little time and cost	2
	With significant time and cost	3
	With prohibitively high time and cost	4
	Irreversible	5
Nature	Negative	-1
	Positive	1
	Neutral	0
Probability	Improbable	1
	Low	2
	Medium	3
	High	4
	Definite	5
Impact significance	Negligible	<3
	Low	>3; <10
	Moderate	>10; <16
	High	>16
Public response	Low	1
	Medium	2
	High	3
Cumulative impact	Low	1
	Medium	2
	High	3
Irreplicable loss of resources	Low	1
	Medium	2
	High	3

7.3 Individual Impacts

Heritage Sites

No	Activity	Impact / risk	Typical mitigation measures	Mitigation type	Potential for residual risk (without mitigation)	Without ("WOM") or With Mitigation (WM)	Duration	Extent	Magnitude/severity	Reversibility	Probability	Impact significance	Nature	Cumulative impact	Irreplaceable loss of resources	Public response
							Description	Description	Description	Description	Description	Rating	Description	Description	Description	Description
Heritage impacts																
Construction / development phase																
1	Siting of beneficiation plant, open pits and mine roads	Impact on historical homestead and graveyard	A 200m heritage conservation buffer must be kept around the historical homestead and graveyard. A site management plan must be compiled and implemented detailing site management conservation measures. Strict and continuous monitoring of the heritage site should construction take place nearby. In the event that the graves will be relocated the necessary grave relocation permits will need to be submitted for SAHRA and approval will be required before any graves are impacted.	Avoidance/Prevention measure	Low	WOM	Permanent	Site	High	Irreversible	Medium	Medium	Negative	Low	High	Low
						WM	Permanent	Site	Low	With significant time and cost	Low	Low	Negative	Low	High	
2	Siting of beneficiation plant, open pits and mine roads	Unidentified / sub-surface archaeological remains	The chance find protocol outlined in the heritage impact assessment must be followed. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and an archaeological specialist should be notified immediately.	Control/reduction measure	Low	WOM	Long term	Site	High	Irreversible	Medium	Medium	Negative	Low	Medium	Low
						WM	Long term	Site	Moderate	With significant time and cost	Medium	Low	Negative	Low	Medium	
Operational phase																
3	Mine operation, heavy machinery movement on site	Impact on historical homestead, graveyard and sub-surface archaeological remains	The 200m heritage conservation buffer must be kept around the historical homestead and graveyard. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and an archaeological specialist should be notified immediately.	Avoidance/Prevention measure	Low	WOM	Long term	Site	High	Irreversible	Medium	Medium	Negative	Low	High	Low
						WM	Long term	Site	Moderate	With significant time and cost	Low	Low	Negative	Low	High	
Closure & decommissioning phase																
4	Rehabilitation of plant, open pit and mine road footprints	Impact on historical homestead, graveyard and sub-surface archaeological remains	The 200m heritage conservation buffer must be kept around the historical homestead and graveyard. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and an archaeological specialist should be notified immediately.	Avoidance/Prevention measure	Low	WOM	Long term	Site	High	Irreversible	Medium	Medium	Negative	Low	High	Low
						WM	Long term	Site	High	With significant time and cost	Low	Low	Negative	Low	High	
Post-closure & rehabilitation phase																
5	Rehabilitation of plant, open pit and mine road footprints	Impact on historical homestead, graveyard and sub-surface archaeological remains	The 200m heritage conservation buffer must be kept around the historical homestead and graveyard. General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and an archaeological specialist should be notified immediately.	N/A	Low	WOM	Long term	Site	High	Irreversible	Low	Low	Negative	Low	High	Low
						WM	Long term	Site	High	With significant time and cost	Low	Low	Negative	Low	High	
Palaeontological impacts																
Construction & operational phase																
6	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	Stromatolites may be encountered in the dolomitic limestone and chert formations. The ECO should take responsibility for supervising the development and should follow the Chance Find Procedure if a significant fossil discovery is made.	Avoidance/Prevention measure	Low	WOM	Long term	Site	Moderate	Irreversible	High	Medium	Negative	Low	Medium	Low
						WM	Long term	Site	Low	Irreversible	Medium	Low	Negative	Low	Medium	

8. Public Participation

Public participation will be included in the larger environmental impact assessment stakeholder engagement process.

9. Conclusions and Recommendations

This study as well as the previous regional HIA study analysed the documented data available as well as investigated the surface occurrences of heritage sites for Portion 1 of the Farm Kameelhoek no. 477, Portion 1 and the remainder of Farm 478 in the Northern Cape Province, close to the town of Postmasburg.

Although several stone tools were noticed over the survey area, only two sites of higher concentrations were noted along non-perennial pans on the northern side of the farm. It is however recommended that all the pan areas selected for mining on the property undergo a second phase of investigation before they are mined. The two known sites should undergo second phase investigation if they are to be mined. Both sites currently fall outside of the proposed excavation and development areas and should not be affected by this phase of mining.

A mining exclusion zone has been indicated for the occupational areas and gravesites associated with the historic homestead (Figure 26). This exclusion zone should be adhered to. If the mine planning changes in the foreseeable future, mitigation of these sites will apply.

The SAHRIS *PalaeoSensitivity* Map places the site within multiple designations, namely red, orange, green and blue. On this basis a Field-based Palaeontological Impact Assessment was performed, and the report is appended to this report.

Provided the recommendations in this report is followed there is no reason, from a heritage point of view, why this development cannot continue.

10. Chance Finds Protocol

It is important to note that, although unlikely, sub-surface remains of heritage sites could still be encountered during construction of the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy vegetation cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered.
- All construction in the immediate vicinity (50m radius of the site) should cease.
- The heritage practitioner should be informed as soon as possible.
- Mitigation measures (such as refilling etc.) should not be attempted.
- The area in a 50m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had enough time to analyze the finds.

Should any archaeological, palaeontological, or cultural heritage resources, including graves or human remains (as defined and protected by the NRA 1999) be identified during the vegetation cleaning, surface scraping, trenching, excavation or construction phases of the development, it is recommended that the process as described below is followed.

On-site Reporting Process:

- The identifier should immediately notify his / her supervisor of the find(s).
- The identifier's supervisor should report the incident to the on-site SHE / SHEQ officer within 24 hours of the find(s).
- Should the find(s) relate to human remains, the on-site SHE / SHEQ officer should immediately notify the nearest SAPS station of the find(s).
- The on-site SHE / SHEQ officer should report the find(s) to the appointed ECO / ELO officer within 24 hours after the find(s) was / were reported by the relevant supervisor.
- Within 72 hours of the find(s) being reported to the SHE / SHEQ officer, the ECO / ELO officer should ensure that the find(s) is reported on the SAHRIS Database, and the relevant heritage specialist is contacted to make arrangements for a heritage inspection.
- Should the find(s) relate to human remains, the ECO/ ELO officer should ensure that the heritage inspection coincides with the SAPS inspection, to verify if the find(s) is / are of forensic, authentic (informal / older than 60 years) or archaeological (older than 100 years) origin.
- The heritage specialist should compile a heritage site inspection report based on the site-specific findings. The report should make recommendations for the destruction, conservation or mitigation of the find(s) and prescribe a recommended way forward for the development. The report should be submitted to the ECO / ELO officer, who should ensure submission thereof on the SAHRIS database.
- SAHRA / the relevant PHRA will state legal requirements for the development to proceed in the SAHRA / PHRA comments on the heritage inspection report.
- The developer should proceed with implementation of the SAHRA / PHRA comment requirements, which may well stipulate permit specifications to proceed.
 - Should the permit specifications stipulate further Phase 2 archaeological investigations (including grave mitigation), a suitable accredited heritage specialist should be appointed to conduct the work according to the applicable SAHRA / PHRA process.

- The heritage specialist should apply for the permit.
- Upon issue of the SAHRA / PHRA permit, the Phase 2 heritage mitigation program may commence.
- Should the permit specifications stipulate destruction of the find(s) under a SAHRA / PHRA permit, the developer should immediately proceed with the permit application.
- Upon the issue of the SAHRA / PHRA permit, the developer may legally proceed with the destruction of the archaeological, palaeontological or cultural heritage resource(s).
- Upon completion of the Phase 2 heritage mitigation program, the heritage specialist will submit a Phase 2 report to the ECO / ELO officer, who should in turn ensure the submission thereof on the SAHRIS database.
- Report recommendations may include that the remainder of a heritage site be destroyed under a SAHRA / PHRA permit.
- Should the find(s) relate to human remains of forensic origin, the matter will be directly addressed by SAPS. A SAHRA / PHRA permit will not be applicable.

NOTE: the SAHRA / PHRA permit and process requirements relating to the mitigation of human remains requires suitable advertising of the find(s), consultation, mitigation and re-internment / deposition process.

Duties of the Supervisor:

1. The supervisor should ensure that all activities in the vicinity of the find(s) are ceased immediately upon the reporting thereof by the identifier.
2. The supervisor should ensure that the location of the find(s) is secured within 24 hours of the reporting thereof by means of a temporary fence allowing for a 5 – 10m heritage conservation buffer zone around the find(s). The temporary conserved area should be sign-posted as a “No Entry – Heritage Site” zone.
3. Where development was impacted on the resource, no attempt should be made to remove artefacts / objects / remains further from their context and should any artefacts / objects / remains that has / have been removed should be collected and placed within the conservation area or kept for safekeeping with the SHE / SHEQ officer.
4. It is imperative that where development has impacted on any archaeological, palaeontological or cultural heritage resources, the context of the find(s) be preserved as much as possible for interpretive and sample testing purposes.
5. The supervisor should record the name, company and capacity of the identifier and compile a brief report describing the events surrounding the find(s).
6. The report should be submitted to the SHE / SHEQ officer at the time of the incident report.

Duties of the SHE / SHEQ officer:

1. The SHE / SHEQ officer should ensure that the location of the find(s) is recorded with a GPS. A photographic record of the find(s), including implementation of temporary conservation measures, should be compiled. Where relevant a scale bar, or object that can indicate the scale, should be inserted in the photographs for interpretive purposes.
2. The SHE / SHEQ officer should ensure that the supervisor’s report, GPS co-ordinate and photographic record of the find(s) are submitted to the ECO / ELO officer.
3. Should the find(s) relate to human remains, the SHE / SHEQ officer should ensure that the mentioned reporting be made available to the SAPS at the time of the incident report.
4. Any retrieved artefacts / objects / remains should, in consultation with the ECO / ELO officer, be kept in a safe place (preferable on site).

Duties of the ECO / ELO officer:

1. The ECO / ELO officer should ensure that the incident is reported on the SAHRIS Database. (The ECO / ELO officer should ensure that he / she is registered on the relevant SAHRIS case with SAHRIS authorship to the case at the time of appointment to enable heritage reporting.)
2. The ECO / ELO officer should ensure that the incident report is forwarded to the heritage specialist for interpretive purposes at his / her soonest opportunity and prior to the heritage site inspection.
3. The ECO / ELO officer should facilitate appointment of the heritage specialist by the developer / construction consultant for the heritage inspection.

4. The ECO / ELO officer should facilitate access by the heritage specialist to any retrieved artefacts / objects / remains that have been kept in safekeeping.
5. Should the find(s) relate to human remains, the SHE / SHEQ officer should facilitate coordination of the heritage site inspection and the SAPS site inspection.
6. The ECO / ELO officer should facilitate heritage reporting and heritage compliance requirements by SAHRA / the relevant PHRA, between the developer / construction consultant, the heritage specialist, the SHE / SHEQ officer (where relevant) and the SAPS (where relevant).

Duties of the Developer / Construction Consultant:

1. The developer / construction consultant should ensure that an adequate heritage contingency budget is accommodated within the project budget to facilitate and streamline the heritage compliance process in the event of identification of incidental archaeological, palaeontological and / or cultural heritage resources during the course of the vegetation cleaning, surface scraping, trenching, excavation or construction phases of the development, when resources not visible at the time of the surface assessment may be exposed.

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APPENDIX A

FIELD BASED PALAEOLOGICAL IMPACT ASSESSMENT

