APPENDIX O: HERITAGE/CULTURAL IMPACT ASSESSMENT REPORT

COZA IRON ORE PROJECT

Proposed Mining Activities

Remainder and Portion 1 of the farm Jenkins 562 located between Kathu and Olifantshoek in the Tsantsabane Local Municipality, Northern Cape Province

Heritage Impact Assessment

Issue Date: 3 February 2016

Revision No.: 1

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Declaration of Independence

The report has been compiled by PGS Heritage an appointed Heritage Specialist for Synergistics Environmental Services. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes.

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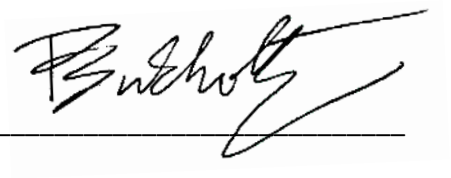
SIGNATURE: 

CLIENT DETAILS

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Report Title	*Proposed mining activities on the Remainder and Portion 1 of the farm Jenkins 562, between Kathu and Olifantshoek, Northern Cape Province*		
Control	**Name**	**Signature**	**Designation**
Author	**P. Birkholtz**		**Heritage Specialist (PGS Heritage)**

Input by Specialists:

- **Dr Maria van der Ryst** was commissioned as Stone Age specialist to carry out a site visit to the identified Stone Age sites and provide an assessment of these sites and outline whether any mitigation measures would be required. Her assessment and recommendations of these Stone Age sites are included in this report.

- **Dr Gideon Groenewald** was commissioned as Palaeontologist to carry out a Palaeontological Desktop Study of the proposed development. This desktop study is attached under Annexure A and its observations and findings are discussed in the report.

As indicated in the table below, this Heritage Impact Assessment report was compiled in accordance with the NEMA Appendix 6 requirements for specialist reports.

NEMA REGS (2014) - APPENDIX 6	RELEVANT PAGES AND SECTIONS
Details of the specialist who prepared the report.	Pages i, ii and iii
The expertise of that person to compile a specialist report including a curriculum vitae.	Page 1 (Section 1.2) and Appendix B
A declaration that the person is independent in a form as may be specified by the competent authority.	Page ii
An indication of the scope of, and the purpose for which, the report was prepared.	Page 1 (Section 1.1)
The date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Page 18 (Section 3.1)
A description of the methodology adopted in preparing the report or carrying out the specialised process.	Page 18 (Section 3.1)
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.	Sections 4 to 9
An identification of any areas to be avoided, including buffers.	Section 9
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.	Section 9 and Figure 33
A description of any assumptions made and any uncertainties or gaps in knowledge.	Page 2 (Section 1.3)
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment.	Section 10
Any mitigation measures for inclusion in the EMPr.	Section 11
Any conditions for inclusion in the environmental authorization.	Sections 11 and 12
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Sections 11 and 12
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Executive Summary and Section 12
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	
A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
A summary and copies if any comments that were received during any consultation process	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
Any other information requested by the competent authority.	Not applicable.

EXECUTIVE SUMMARY

PGS Heritage was appointed by Synergistics Environmental Services to carry out a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed Coza Iron Ore Project located on the Remainder and Portion 1 of the farm Jenkins 562. The study area is located south-west of Kathu, east of Olifantshoek and north of Postmasburg and is located in the Tsantsabane Local Municipality of the Northern Cape Province.

Archival and Historical Desktop Study

The work commenced with an archival and historical desktop study. This study comprised an assessment of the available archival and historical maps as well as a compilation of a historic overview of the study area and surroundings.

The following observations can be made as a result of the archival and historical study:

- In 1886 the farm formed part of the newly established "Langberg Native Reserve".
- The Langberg Rebellion of 1897 represents one of the more significant historic events associated with this area. During the rebellion, on 14 June 1897, the No. 13 (Papkuil) Mounted Rifle Club was ordered to occupy "Mokanen". The farm Mokaneng is located immediately to the north-east of Jenkins.
- After the events of the 1897 rebellion, the Langberg Reserve was confiscated by the British Authorities.
- The farm Jenkins would have been surveyed by land surveyor J.C. Wessels and his assistant D. Roos in November 1897.
- During the late nineteenth century the farm Jenkins was occupied by H.J. Delport.
- H.J. Delport transferred the farm to P.M. de Kock in 1905.
- A portion of the farm known as Mooihoek was transferred from P.M. de Kock to J.J. de Kock on 12 February 1919. This portion represents a significant section of the present study area.

Previous Archaeological Research and Studies

Previous studies conducted in the surroundings of the study area have identified a number of archaeological sites. These include Stone Age (ESA, MSA and LSA) sites including find spots, surface scatters and rock art sites; pre-colonial specularite mining sites; historic structures and buildings; historic mining sites as well as graves and cemeteries.

Due to the arid nature of the surroundings of the study area, it seems likely for many of the archaeological site types (with the possible exception of pre-colonial and historical mine sites) to be concentrated in proximity to water sources such as riverine edges and pans.

This desktop study study has highlighted the archaeological potential of the study area and surroundings thereby underlining the need for archaeological fieldwork to be undertaken of the proposed development footprint area. During the fieldwork a total of seven sites were identified, of which six couldclearly be identified as archaeological sites. The fieldwork findings are discussed in more detail below.

Palaeontology

The farm Jenkins is underlain by Vaalian aged Gamagara and Ongeluk Formations of the Olifantshoek Group, Griqualand West Supergroup and Tertiary aged surface limestone or calcretes. The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 of the main report.

The Vaalian aged Gamagara and Ongeluk Formations are allocated a Moderate Palaeontological sensitivity and the recording of micro-fossils during detailed analyses of ore samples must be reported to SAHRA. This requirement however does not fall within the scope of the EMP of the project and is of academic interest only. A High sensitivity rating for Palaeontological Heritage is allocated to the area of the farm underlain by surface limestone. Mining activity in this area is however restricted to surface infrastructure and no significant fossil finds are expected.

The following recommendations are made in terms of palaeontology:

1. The EAP as well as the ECO for this project must be made aware of the fact that sediments of the Gamagara and Ongeluk Formations, Olifanthoek Group, contain significant fossil remains, albeit mostly stromatolite structures and micro-fossils. The calcrete deposits can contain significant remains of Tertiary aged animals.
2. A High Palaeontological sensitivity is allocated to surface limestones and a Moderate Sensitivity to the rest of the area. If any fossils, most notably stromoatolite structures, are recorded during investigations of the ore bodies the ECO must be notified and a qualified palaeontologist must be appointed to report these finds to SAHRA by conducting of a Phase 1 PIA investigation.
3. No further mitigation for Palaeontological Heritage is recommended for this development.

Fieldwork Findings

A total of seven heritage sites were identified within the proposed development footprints located on the farm Jenkins 562. The table below provides an overview of all sevem these identified heritage sites.

Site	Latitude	Longitude	Description	Significance
JNK 1	27° 55' 25.9S	22° 59' 13.7"E	Surface scatter of MSA and LSA lithics.	Medium
JNK 2	27° 54' 56.0"S	22° 59' 26.7"E	Historic farmstead older than 60yrs and an associated low density midden.	Medium
JNK 3	27° 54' 51.1"S	22° 58' 50.0"E	MSA/LSA lithics around a pan.	Medium
JNK 4	27° 54' 46.2"S	22° 58' 50.0"E	Rectangular stone structure, possible grave.	Medium - High
JNK 5	27° 55' 15.8"S	23° 01' 23.1"E	Low density surface scatter of MSA lithics.	Medium
JNK 6	27° 55' 13.4"S	23° 00' 51.0"E	Rock shelter with Rock Art and low density surface scatter LSA lithics.	High

JNK 7	27° 55' 55.3"S	23° 00' 21.1"E	Five crescent-shaped stone structures, possibly associated with the events of 1897.	Medium - High

An overlay of these seven heritage sites was made over the available mining development layout plan. From this it is evident that sites JNK 1, JNK 3, JNK 5 and JNK 7 will be directly impacted upon by the proposed development. This said, impacts are also expected on sites located in close proximity to the mining development footprints, including JNK 2, JNK 4 and JNK 6.

Impact Assessment

Assessments were made of the impact risk of the proposed mining development on these five heritage sites. These calculations have revealed that the impact risk of the proposed development on six of the seven identified sites (JNK 1, JNK 2, JNK 3, JNK 4, JNK 5 and JNK 6) fall within Impact Class 3, which represents a Moderate Impact Risk. Furthermore, the impact risk of the proposed development on site JNK 7 falls within Impact Class 4, which represents a High Impact Risk. As a result, mitigation would be required for all the sites.

Mitigation

The following mitigation measures would be required for the identified heritage sites.

Mitigation Measures required for JNK 1:

The following mitigation measures are required for JNK 1:

- A collection of the lithics should be made as the locality was clearly a focus point on the landscape and was frequented by hunting and gathering groups.
- In addition, an investigation using Shovel Test Pits (STP's) in the red sands will establish whether subsurface deposits are indeed present.

- The proposed infrastructural developments include the construction of offices on the ridge above the site. It is proposed that the lithic collection may be housed at the office to serve as a small exhibition on the prehistory of the local region.
- A permit would be required from the South African Heritage Agency (SAHRA) for the mitigation measures as well as the small exhibition of collected material.
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

Mitigation Measures required for JNK 2:

The following mitigation measures are required for JNK 2:

- The farmhouse and farmstead in its entirety must be recorded using photographs and a surveyed site layout plan.
- The farmhouse and structures in its immediate surroundings (including the outside toilet and small rectangular structure with annex) must be recorded with measured drawings and photographs. Such measures drawings must include facades and plans.
- A report must be compiled containing the results of the recording activity.
- An application must be lodged with the relevant heritage authority to obtain a permit allowing for the disturbance to the old farmhouse and adjacent structures.

Mitigation Measures required for JNK 3:

The following mitigation measures are required for JNK 3:

- In view of the future development it is recommended that the pan site should be mitigated through sampling of lithics from areas of higher densities.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

Mitigation Measures required for JNK 4:

The following mitigation measures are required for JNK 4.

An attempt must be made to preserve the possible grave *in situ.* To achieve this, the following would be required:

- Demarcate a 5m buffer around the possible grave.
- Erect a fence (preferably a palisade one) with lockable gate around the possible grave.
- In the event that the possible grave cannot be excluded from the development footprint, a grave relocation process, as outlined below, needs to be implemented.

Whenever a grave relocation process is required, it must include the following:

- A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin so as to obtain their consent for the relocation of the grave. This social consultation would also assist in obtaining information on the possible grave to see if it is indeed a grave or not.
- Bilingual site notices indicating the intent of the excavation / relocation
- Bilingual newspaper notices indicating the intent of the excavation / relocation
- Permits from the relevant authorities.
- An archaeological excavation of the possible grave to assess whether a grave is located here.
- Should a grave be found, an exhumation process must be implemented that keeps the dignity of the remains and family intact and will safeguard the legal rights of the families as well as that of the development company.
- The process must be done by a reputable company well versed in grave mitigation.

Mitigation Measures required for JNK 5:

The following mitigation measures are required for JNK 5:

- A collection of the lithics should be made as the locality was clearly a focus point on the landscape that was frequented over time.

- In addition, an investigation through Shovel Test Pits (STP's) would establish whether subsurface deposits are present.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

Mitigation Measures required for JNK 6:

The following mitigation measures are required for JNK 6:

- A 100m buffer area surrounding the rock shelter must be kept free of any development.
- The site must be recorded using accepted practice and techniques.
- An archaeological monitoring program must be implemented to monitor the rock art site during the Construction and Mining Phases of the proposed development. Any impacts on the site identified during these monitoring visits must be addressed swiftly, including the recommendation and implementation of additional mitigation measures. Such measures may include the expansion of the buffer area and increased monitoring frequency.
- The frequency of monitoring visits can start off at one visit every two weeks during the Construction and Mining Phases. Each of these monitoring visits must be preceded by a monitoring report containing the observations and photographs of the particular monitoring visit. Recommendations must also be made.
- All monitoring must be undertaken by a suitable qualified and experienced archaeologist.

Mitigation Measures required for JNK 7:

The following mitigation measures are required for JNK 7:

- The site must be recorded with photographs and a layout plan.

- A permit application must be lodged with the South African Heritage Resources Agency (SAHRA) to allow for the subsequent mitigation measures to be implemented.
- Once the permit is received, a metal detector must be used to investigate the site. This must be augmented by a Shovel Test Pits (STP's) investigation. Both techniques will be used to further assess and interpret the site.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced archaeologist.

Conclusions

On the condition that the mitigation measures outlined in this report are undertaken, the development is not expected to have any significant impact on heritage sites. As such no heritage reasons can be given for the development not to continue.

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1 INTRODUCTION

PGS Heritage was appointed by Synergistics Environmental Services to carry out a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed Coza Iron Ore Project located on the Remainder and Portion 1 of the farm Jenkins 562. The study area is located south-west of Kathu, east of Olifantshoek and north of Postmasburg and is located in the Tsantsabane Local Municipality of the Northern Cape Province.

1.1 Scope of the Study

The HIA aims to inform the EIA in the development of a comprehensive EMP to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This Heritage Impact Assessment Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 42 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Polke Birkholtz, the Project Manager, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited with the CRM Section of ASAPA. He has 18 years experience in the heritage assessment and management field and holds a B.A. (cum laude) from the University of Pretoria specialising in Archaeology, Anthropology and History as well as a B.A. (Hons.) in Archaeology (cum laude) from the same university.

Dr Maria van der Ryst acted in advisory capacity as specialist for the Stone Age. She has undertaken extensive and in-depth research at several Stone Age and rock art localities. She has also conducted several Phase 2 Archaeological Impact Assessments with a focus on the Iron Age and the Stone Age and specialist studies on the Stone Age.

Dr Gideon Groenewald, the appointed Palaeontologist for this project, holds a PhD in Geology from the Nelson Mandela Metropolitan University (1996) and the National Diploma in Nature Conservation from the University of South Africa (1990). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

1.3 Assumptions and Limitations

The following assumptions and limitations are relevant to this study:

- Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.
- Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.
- The findings of this report are based on an intensive walkthrough of all the proposed development footprint areas located within the Remainder and Portion 1 of the farm Jenkins 562. As such, no fieldwork was undertaken outside these footprint areas and outside these farm portions. Should any footprints be identified which falls outside of the ones assessed as part of this study, such additional footprints will have to be assessed by a heritage specialist to ensure that no detrimental impact takes place to the heritage fabric of the area.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

i. National Environmental Management Act (NEMA), Act 107 of 1998
ii. National Heritage Resources Act (NHRA), Act 25 of 1999
iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002
iv. Development Facilitation Act (DFA), Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources (CRM).

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impact Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Plan (EMP) – Section (34)(b)
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
    a. Protection of Heritage Resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a. Section 39(3)
iv. Development Facilitation Act (DFA) Act 67 of 1995
    a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…" The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any

authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

Terminology and Abbreviations

Archaeological resources

This includes:

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

iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

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

Development

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

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

Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance

Holocene

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

Late Stone Age

The archaeology of the last 20 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

The archaeology of the Stone Age between 20 000-300 000 years ago, associated with early modern humans.

Palaeontology

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

The table below provides a description of the abbreviations which are used in this report:

Abbreviations	*Description*
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
BIF	Banded Iron Formations
CCS	Cryptocrystalline Silica
CRM	Cultural Resource Management
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage and Grave Relocation Consultants
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
ROD	Record of Decision
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

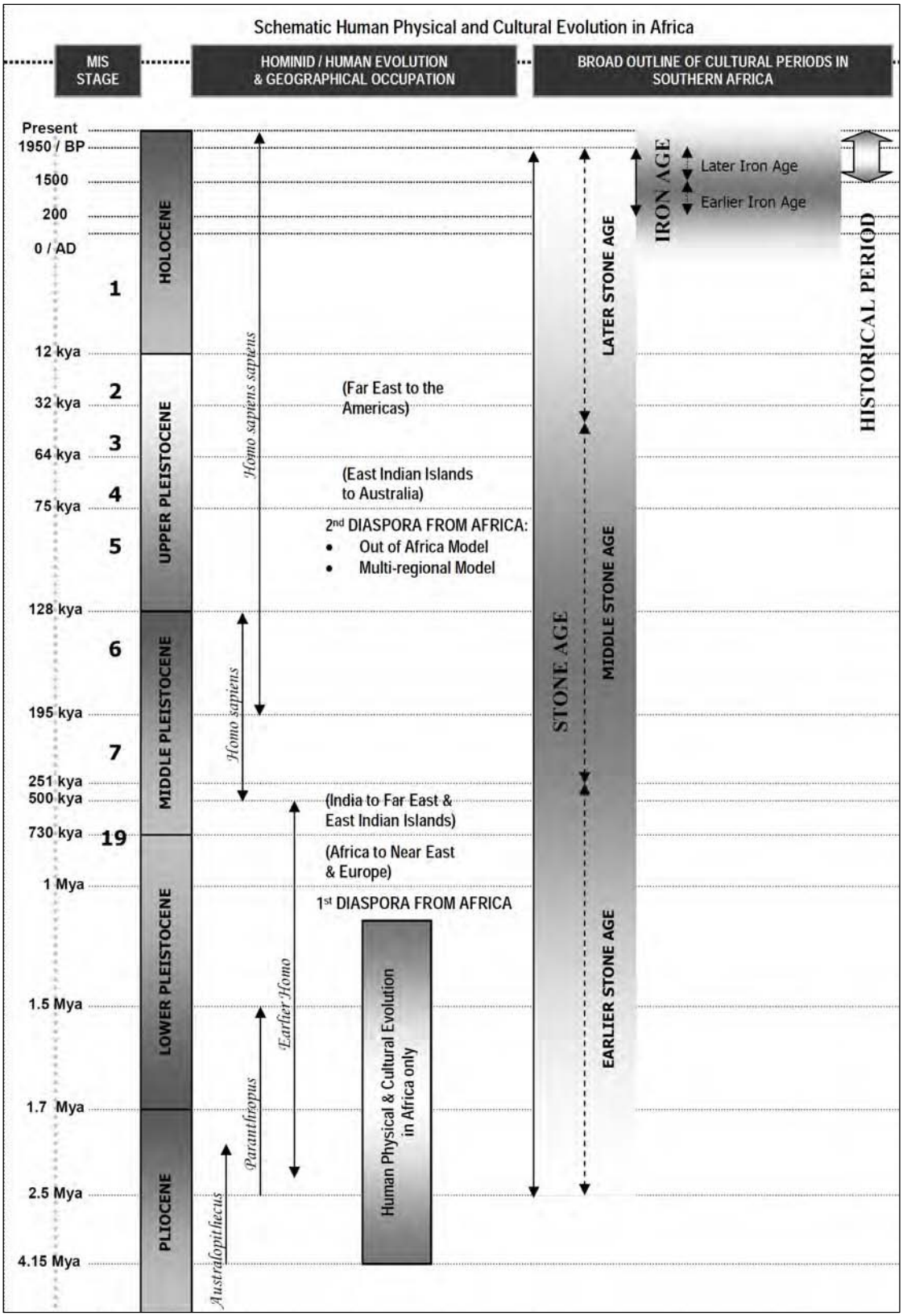

Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Coordinates	Approximate Centre of Proposed Development: S 27° 55' 02.71" E 22° 59' 46.47"
Property	The Remainder and Portion 1 of the Farm Jenkins 562.
Location	The study area is located roughly 23.1 km south-west of Kathu, 23.1 km east of Olifantshoek and 42.9 km north-west of Postmasburg.
Extent	The Remainder and Portion 1 of the farm is approximately 1,500 hectares in extent. The actual footprint areas are of course much smaller than the property. The development footprint is approximately 200 hectares in extent.
Land Description	Please note that the vegetation description that follows was obtained from the Environmental Scoping Report of Synergistics (2015) that was compiled for the farm Driehoekspan. According to available topographic maps, the general topography within the study area is flat to undulating. A prominent hill is located on the eastern corner of farm Jenkins, which has an elevation of approximately 1,365 mams. Two dry river beds bisect the Remainder and Portion 1 of the farm Jenkins, while one large pan is located on its western end. According to the vegetation classification of South Africa by Mucina & Rutherford (2006, Biodiversity GIS vegetation map), there are two vegetation types present in the study areas – Kuruman Thornveld and Kuruman Mountain Bushveld. The two vegetation types are described in more detail below. The Kuruman Thornveld occurs on flats from the vicinity of Postmasburg and Danielskuil (west of the Kuruman Hills) in the south extending via Kuruman to Tsineng and Dewar in the north (Mucina & Rutherford 2006). This thornveld is typified by flat rocky plains and some sloping hills with a very well developed, closed shrub layer and well developed open tree stratum consisting of camel thorn (*Acacia erioloba*). Smaller trees in this vegetation unit include Blackthorn (*Acacia mellifera subsp*. *Detinens*) and Shepherd's tree (*Boscia albitrunca*). Taller shrubs are Velvet Brandybush (*Grewia flava*), River Honeythorn (*Lycium hirsutum*), Camphor Bush (*Tarchonanthus camphoratus*) and Common Spike-Thorn (*Gymnosporia buxifolia*). Small shrubs present are Besembossie (*Gnidia polycephal*), *Helichrysum* species (e.g. Golden Everlasting), *Hermannia* species (e.g. Doll's Rose) and *Plinthus sericeus*. Common grasses are Arrowfeather Threeawn (*Aristida meridionalis)*, *A. stipitata* and Lehmann Lovegrass (*Eragrostis lehmanniana*). The Kuruman Mountain Bushveld covers the hills with generally gentle to moderate slopes and hill pediment areas, with an open to closed shrubveld. The grass layer is fairly well developed. Common large shrubs include Blackthorn (*Acacia mellifera* ssp. *Detinens*), common *Guarri, Euclea* undulate, Bloubos *Diospyros lycioides*, *Searsia tridactyla*, Yellow Pomegranate (*Rhigozum obovatum*) and Vaalbos (*Tarchonanthus camphoratus* and *T. obovatus*). Shepherd's trees (*Boscia albitrunca*) are occasional. Several rock figs (*Ficus cordata*) grow on the

peaks of the hills where large boulders or sheer rock outcrops are a feature. Common grasses include Black Spear Grass (*Heteropogon contortus, Enneapogon sp., Eragrostis sp*)., Koperdraadgras (*Aristida diffusa*) and Oxtail Buffalo Grass (*Cenchrus ciliaris*). Dwarf shrubs and herbaceous species include (*Hermannia species, Eriocephalus sp., Helichrysum*) species and a variety of small legume species such as *Indigofera sp.*

According to the palaeontological desktop carried out by Dr Gideon Groenewald (2015) the farm Jenkins is underlain by Vaalian aged rocks of the Gamagara and Ongeluk Formations of the Olifantshoek Group, Griqualand West Supergroup as well as Tertiary Aged Calcretes and surface deposits. The Vaalian aged Gamagara Formation consists primarily of Quartzie, conglomerate, flagstone and shale, with manganese enriched layers of conglomerate and shale. The Vaalian aged Ongeluk Formation consists primarily of volcanic rocks. The Tertiary aged surface limestone and calcrete underlies the lower lying areas in the western part of the study area.

Figure 2 – Location of the Study Area within its Regional Context.

2.2 Technical Project Description

2.2.1 Introduction

The section that follows was obtained from the Jenkins Specialist Information Document provided by the client.

The COZA Iron Ore Project will involve the mining of iron ore from three Farms namely Driehoekspan 435 (Remaining Extent) Doornpan 445 (Portion 1). and Jenkins 562 (Remainder and Portion 1). Although the project includes all three mining sections, mining activities will be undertaken under three different mining rights. Synergistics (now part of the SLR Group) is undertaking three different EIA's in support of the mining right applications. This Heritage Impact Assessment is in support of the Synergistics EIA for the farm Jenkins only. Separate heritage impact assessments are carried out for the two other farms.

The Life of Mine (LOM) is 7 years with the Jenkins Section being mined throughout the LOM. The COZA resources located on the farm Jenkins contain hematite ore close to the surface, with some outcrops of iron ore also observed.

The operational strategy for the COZA Mining Iron can be described as mining operations taking place at Jenkins (north), and Driehoekspan and Doornpan combined (south). Run of mine (ROM) material is processed as Direct Selling Ore (DSO). The envisioned processing strategy involves a single plant that processes DSO through a comminution circuit. The product will be placed on the domestic rail by means of a siding, and then transported to the Vanderbijlpark steel mill. Following a high-level trade-off study it was decided to assume the location of the plant at Jenkins. The ROM material from the Doornpan and Driehoekspan will be crushed and screened by a mobile jaw crusher, from where it will be transported by road trucks to the plant.

The proposed mining development at Jenkins will comprise a number of development footprints, which includes an opencast pit, explosive magazine, rail loop, haul roads, service and access roads, crushing and screening plant, administration block and workshop area, waste rock dump, pollution control dam, conveyor belt, ore and stockpile area as well as a soil stockpile area. These development footprints will be discussed on an individual basis in more detail below.

2.2.2 Opencast Pit

Due to the shallow nature of the resources it would ideally be mined by an opencast mining method. Mining will be conducted by means of conventional truck and shovel open pit mining operations. For the operations at the COZA Mine, the mining process entails planning, drilling, blasting, loading and hauling. The mine will operate 299 days per annum (allowing for 13 lost days due to public holidays and 48 Sundays per annum) on a 24-hour basis with shifts rotating on 2 - by 10-hour duration. The combined LOM for all three pits is 7 years. The mining fleet will be available on site as mining commences per pit. The mining fleet will be available at Jenkins at the start of year 1 of the mining schedule.

As indicated above, open pit mining will be undertaken by means of truck and shovel. The open pit at Jenkins will be located on the eastern corner of the farm, and its design was constrained by a 9m buffer along its boundaries with neighbouring farms. The double lane traffic ramp system which is 25m wide will be used to access the open pit at Jenkins.

Rock fragmentation will be undertaken by drilling and blasting and it is assumed that all the material to be mined at the project will require blasting. Drilling is the first operation performed at most open pit mining operations. Rotary drills are predominantly used, although for smaller holes (<171 mm) applications down the hole (DTH) hammer drills have often been employed. A diesel crawler DRH drill rig will be utilised for the production holes for the ore and waste benches and the wall control blasting holes.

Paddock blasting is envisioned for ore blasts in order to control throw because once sampling determines the grade distribution in the bench to be blasted, the general aim is to break the rock sufficiently without disrupting the known grade distribution significantly.

In areas where mining slopes have to remain intact for extended periods, it is good practice to minimise the fracturing of the high walls during blasting. In such identified areas, wall control blasting, also known as pre-splitting, can be considered. There is limited guidance available for designing a pre-split in a Greenfields project area and hence further investigation on this subject will have to be performed.

A buffer blast (small blast) will be conducted to remove the final waste material and leave a clean and undamaged high wall. It is usually fired against a pre-split line, which has predefined

the final wall orientation. The balance between fragmentation and peripheral damage is critical in buffer blasting.

2.2.3 Explosive Magazine

An on-site explosives magazine will be constructed for the storage of explosive consumables (fuses, boosters, gassing etc.). This area will be situated as far as possible from buildings and structures (See site layout). The area will be fenced off with barbed wire on top, locked gates with no entry and explosive signs. The whole fenced area will be surrounded by a sand berm. Inside the area separate magazines, one for each type of explosive will be required. The magazines are not allowed to stand next to each other and must be a distance apart within the fenced area. The area must be big enough for the explosives truck to enter and the gate locked behind it during deliveries.

Site mixed bulk emulsion will be used. Emulsion based explosives are made up of two separate products that has to be mixed in a specific ratio before it becomes an explosive. The two products are only mixed as it is pumped into the blast hole. This means that the two products don't have to be stored in a magazine. They must just be stored in two different locations to prevent accidental mixing. The emulsion will be delivered and pumped by the explosive company on the day of the blast

2.2.4 Rail Loop

The rail infrastructure to be provided at Jenkins includes a balloon rail through the LOS. Typically a balloon arrangement would be a suitable option and for this a track length of +/- 7km is required. Other types of rail access are also possible, such as linear yards instead of balloon type layouts, but will involve shunting and add additional time to the turn-around process. Typically a balloon type arrangement enables the main line TFR loco to stay attached to the train during loading whilst a linear yard arrangement necessitate that the locos be detached and run around the load before or after loading commences. In any event, both arrangements typically result in the same total track length required and therefore capital cost. A requirement from TFR is that no shunting and/or loading takes place on the TFR main line and therefore a complete train length run off would need to be provided off the main line (at least 1.25km track length). In addition, the main line locomotives need to stay attached

during loading (balloon type layout) or the main line locos must detach and escape before loading commence (linear yard with run around facility).

2.2.5 Haul Roads

Haul roads will be gravel roads connecting the mine pit areas with the stockpile and waste rock dump areas. The haul roads will be 25m wide to cater for the heavy duty haul trucks. The road surface will be regularly sprayed with a dust retardant such as “Dust-A-Side” or similar. The gradient will be designed to suit the mine vehicle requirements. A brake test ramp will be constructed to minimise the risk of brake related accidents on site.

2.2.6 Service Roads

Service roads will be gravel roads used mainly by light to medium duty vehicles travelling to specific mine infrastructure facilities on each of the sites.

2.2.7 Crushing and Screening Plant

. The COZA Iron Ore Concentrator is designed to produce 2 million tonnes of product at 62% Fe per annum. On-Grade and Off-Grade ore will be mined and stockpiled separately and blended in suitable quantities to produce the required grade.

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. The comminution circuit consist of a 3 stage crushing plant with open circuit primary crushing and closed circuit secondary and tertiary crushing producing a -32mm product. The -32mm product from the comminution circuit will report to the Product Sizing and Storage section where it will be screened to produce a -32mm +8mm lumpy product and a -8mm fines product which will be stockpiled separately.

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. Allowance has been made for a rapid load out system in order to reclaim the final stockpiled products and load a train within a set period of time. The plant is designed to operate 299 days per year at an overall availability / utilisation of 40.96%, translating to 3588 hours per annum and a total feed rate of 557 dmtph.

2.2.8 Administration Block and Workshop Area

The buildings and structures associated with the Administration Block and Workshop Area will include the following:

- Main Office and Training Facility comprising a combination of mobile and modular units with a footprint area of 715m^2
- Ablution Rooms comprising a mobile unit (with a footprint area of 27m^2
- Diesel and Lube Facility comprising eight 72,000 diesel tanks and one partitioned lubrication tank
- Change house comprising a modular building unit with a footprint area of 715m^2
- Main Workshops comprising a heavy and light motor vehicle workshop with a footprint area of 715m^2
- Wash bay with a footprint area of 150m^2
- Store comprising a complete receiving, storage and dispatch solution with a footprint area of 800m^2

2.2.9 Waste Rock Dump

The overburden resulting from initial mining is expected to be environmentally benign. Some material may meet the minimum requirements for road layer works. Thus, the overburden shall be used in road pavement construction, berm construction for haul roads and construction of dam walls and stockpile lay down areas. Once the infrastructure has been completed, overburden will be dumped outside the pit at the waste dump site.

Waste rock generated from the mining operation will be placed on the waste dump. The waste dump will be located as close to the pit area as possible to minimise transportation cost. During the active waste-tipping phase the waste dump is constructed at the material's natural angle of repose of approximately 35 degrees. The waste dump will progress by tipping from lower levels. The waste dump should be progressively rehabilitated with topsoil, where possible.

2.2.10 Pollution Control Dam

Based on South African legislation (under Regulation 704 of the National Water Act.) no

polluted storm water may overflow into the environment more frequently than once in a 50-year period. Pollution control dams will be provided to contain polluted run-off, preventing spills into the environment. Contaminated rainwater is collected through storm water channels or pipes and directed towards the pollution control dam. For these dams not to spill, it is essential that water be drawn off as fast as possible to make provision for the next rainfall event. Provision has been made for water to be abstracted from the dams via submersible pumps and to then be utilised for dust suppression.

The dam will be designed as an earth embankment dam. The dam will be built to the requirements of the environmental authorities and the DWA dam safety office. Suitable HDPE linings and sub soil drainage will be provided. The dirty water dam will also have spillways that can accommodate the 1 in 100-year flood event. Silt traps will be provided for the water flowing into the dam and will be designed to trap silt particles during the expected daily inflows. During storm events, some of the particles will not be trapped.

2.2.11 Other Development Footprints

Other development footprints not mentioned above, include the following:

- Ore and Stockpile Area
- Soil Stockpile Area
- Conveyor Belt
- Security Fencing and Access Control.

The development footprints are shown on the mine layout plan below.

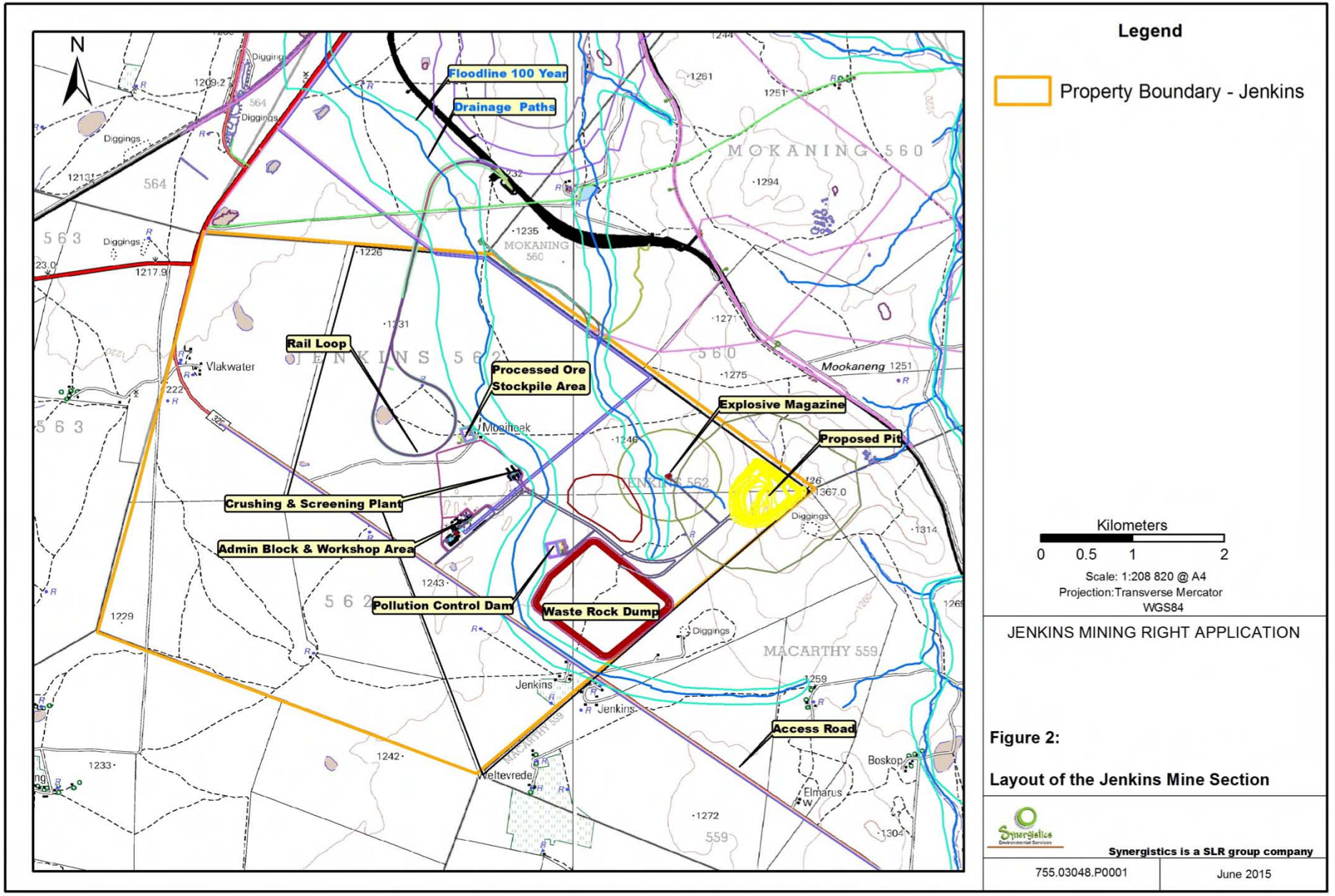


Figure 3 – Mining Development Layout Plan for the farm Jenkins. This mage was supplied by Synergistics.

3 ASSESSMENT METHODOLOGY

3.1 Methodology for Assessing Heritage Site Significance

PGS Heritage compiled this report for proposed mining activities. The applicable maps, tables and figures are included as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

Step I – Desktop Study: The background information to the field survey leans greatly on the archival and historical cartographic material assessed as part of the study as well as a study of the available literature. The desktop study also included a detailed historical overview of the study area and surrounding landscape as well as a palaeontological desktop study that was carried out by Dr Gideon Groenewald.

Step II – Field Survey: Physical field surveys comprising intensive walkthroughs of the proposed footprint areas were undertaken from Wednesday, 22 July 2015 to Friday, 24 July 2015 as well as Monday, 27 July 2015 and Tuesday, 28 July 2015.

The fieldwork was undertaken by a team comprising two professional archaeologists (Polke Birkholtz and Heidi James-Birkholtz). On Wednesday, 19 August 2015 Heidi James-Birkholtz accompanied Stone Age specialist Dr Maria van der Ryst to the Stone Age sites identified during the fieldwork. Her assessments and recommendations with regard to these sites are included in this report.

Step III – Report: The final step involved the recording and documentation of relevant heritage resources, as well as the assessment of resources regarding the heritage impact assessment criteria and report writing, as well as mapping and recommendations.

The significance of heritage sites was based on five main criteria:

- site integrity (i.e. primary vs. secondary context),
- amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
    - Low - <10/50m2
    - Medium - 10-50/50m2

- High - >50/50m2

- uniqueness and
- potential to answer present research questions.

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

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate development position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report (see **Table 1**).

Table 1: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High/Medium	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium	Recording before destruction
Generally Protected C (GP.C)	Grade 4D	Low	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

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

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given in **Table 2**.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria

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

A more detailed description of each of the assessment criteria is given below.

Significance Assessment

The significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, 10 structures younger than 60 years might be affected by a proposed development, and if destroyed the impact can be considered as VERY LOW in that the structures are all of Low Heritage Significance. If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will

be considered to be HIGH to VERY HIGH. A more detailed description of the impact significance rating scale is given in **Table** 3 below.

Table 3: Description of the significance rating scale

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

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 4**.

Table 4: Description of the spatial significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment.

The temporal or duration scale is rated according to criteria set out in **Table 5**.

Table 5: Description of the temporal rating scale

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

Degree of Probability

The probability or likelihood of an impact occurring will be outlined in **Table 6** below.

Table 6: Description of the degree of probability of an impact occurring

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

Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in **Table 7**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making.

Table 7: Description of the degree of certainty rating scale

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

Quantitative Description of Impacts

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

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

An example of how this rating scale is applied is shown below:

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium Term	Could Happen	**Low**
Impact on heritage structures	2	3	3	3	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the table below.

Table 9: Impact Risk Classes

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

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

4 CURRENT STATUS QUO

4.1 Description of Study Area

The proposed activity comprises mining activities on the Remainder and Portion 1 of the Farm Jenkins 562, between Kathu and Olifantshoek, Northern Cape Province.

The general topography of the study area can be described as largely flat (especially along the north-western and south-southeastern ends of the study area) interposed by low quartzite ridges with a north-west by south-east orientation. A prominent hill is located on the eastern corner of farm Jenkins, which has an elevation of approximately 1,365 mams. Two dry river beds bisect the Remainder and Portion 1 of the farm Jenkins, while one large pan is located on its western end.

According to the vegetation classification of South Africa by Mucina & Rutherford (2006, Biodiversity GIS vegetation map), there are two vegetation types present in the study areas – Kuruman Thornveld and Kuruman Mountain Bushveld.

The Kuruman Thornveld occurs on flats from the vicinity of Postmasburg and Danielskuil (west of the Kuruman Hills) in the south extending via Kuruman to Tsineng and Dewar in the north (Mucina & Rutherford 2006). This thornveld is typified by flat rocky plains and some sloping hills with a very well developed, closed shrub layer and well developed open tree stratum consisting of camel thorn (*Acacia erioloba*). Smaller trees in this vegetation unit include Blackthorn (*Acacia mellifera subsp*. *Detinens*) and Shepherd's tree (*Boscia albitrunca*). Taller shrubs are Velvet Brandybush (*Grewia flava*), River Honeythorn (*Lycium hirsutum*), Camphor Bush (*Tarchonanthus camphoratus*) and Common Spike-Thorn (*Gymnosporia buxifolia*). Small shrubs present are Besembossie (*Gnidia polycephal*), *Helichrysum* species (e.g. Golden Everlasting), *Hermannia* species (e.g. Doll's Rose) and *Plinthus sericeus*. Common grasses are Arrowfeather Threeawn (*Aristida meridionalis)*, *A. stipitata* and Lehmann Lovegrass (*Eragrostis lehmanniana*).

The Kuruman Mountain Bushveld covers the hills with generally gentle to moderate slopes and hill pediment areas, with an open to closed shrubveld. The grass layer is fairly well developed. Common large shrubs include Blackthorn (*Acacia mellifera* ssp. *Detinens*), common *Guarri, Euclea* undulate, Bloubos *Diospyros lycioides*, *Searsia tridactyla*, Yellow Pomegranate (*Rhigozum obovatum*) and Vaalbos (*Tarchonanthus camphoratus* and *T.*

obovatus). Shepherd's trees (*Boscia albitrunca*) are occasional. Several rock figs (*Ficus cordata*) grow on the peaks of the hills where large boulders or sheer rock outcrops are a feature. Common grasses include Black Spear Grass (*Heteropogon contortus, Enneapogon sp., Eragrostis sp*)., Koperdraadgras (*Aristida diffusa*) and Oxtail Buffalo Grass (*Cenchrus ciliaris*). Dwarf shrubs and herbaceous species include (*Hermannia species, Eriocephalus sp., Helichrysum*) species and a variety of small legume species such as *Indigofera sp.*

According to the palaeontological desktop carried out by Dr Gideon Groenewald (2015) the farm Jenkins is underlain by Vaalian aged rocks of the Gamagara and Ongeluk Formations of the Olifantshoek Group, Griqualand West Supergroup. To the south of the tar road (outside of the present study area), Tertiary Aged Calcretes and surface deposits are found. The Vaalian aged Gamagara Formation consists primarily of Quartzite, conglomerate, flagstone and shale, with manganese enriched layers of conglomerate and shale. The Vaalian aged Ongeluk Formation consists primarily of volcanic rocks.

The surface geology of the study area can be described as largely flat sections underlain by the Ongeluk Formation of volcanic rocks with Kalahari red sands characterizing the surface. These flat areas are interposed by low quartzite ridges of the the Gamagara Formation, which includes the hill on the eastern corner of the site. This hill encompasses sections of quartzite, banded iron formation (BIF), shale, dolomite as well as an outcrop of hematite on the eastern corner of the farm. Tertiary Aged Calcretes and surface deposits, situated immediately to the south and south-west of the study area, as well as banded iron formation outcrops from within the study area, could have been utilized during the Stone Age as sources of Cryptocrystalline Silicas (CCS) for lithic manufacture.

The wider surroundings of the study area are characterised by both mining activities as well as limited farming activities. In historic and recent time, the study area itself would have been utilized for farming activities, presumably livestock farming such as cattle and sheep. The farmstead on the Mooihoek portion of the farm (see site JNK 2) represents tangible remains for such historic to recent farming activities.

The slopes of the prominent hill on the eastern end of the study area have been extensively disturbed by prospecting activities. These prospecting activities were preceded by an Archaeological Impact Assessment undertaken by Webley and Halkett in 2010.

Figure 4 - General view of the study area from the hill on its eastern end looking toward the west.

Figure 5 – Closer view of a section of the hematite outcrop on the far eastern corner of the study area.

Figure 6 – Previous prospecting activities along the slopes of the hill on the eastern end of the study area

Figure 7 – General view of the northern end of the study area characterized by red sand and camel thorn trees.

Figure 8 – Kalahari red sands with an oxidized quartzite outcrop. In the back, a low quartzite ridge can be seen.

Figure 9 – A section of the pan on the western end of the study area can be seen..

5 ARCHIVAL AND HISTORICAL MAPS OF THE STUDY AREA

5.1 Original Survey Diagram for the Farm Jenkins, 1897

The figure below depicts the original survey diagram for the farm Jenkins that was surveyed by Wessels and Roos in November 1897. The diagram also depicts all subsequent subdivisions and additions to the property. The following observations can be made from the map:

- With the exception of a number of roads, no heritage features are depicted within the Remainder and Portion 1 of the farm Jenkins (see red line). No evidence for these roads could be found in the field. Furthermore, it is not altogether certain whether these roads were main wagon roads or rather secondary farm tracks.

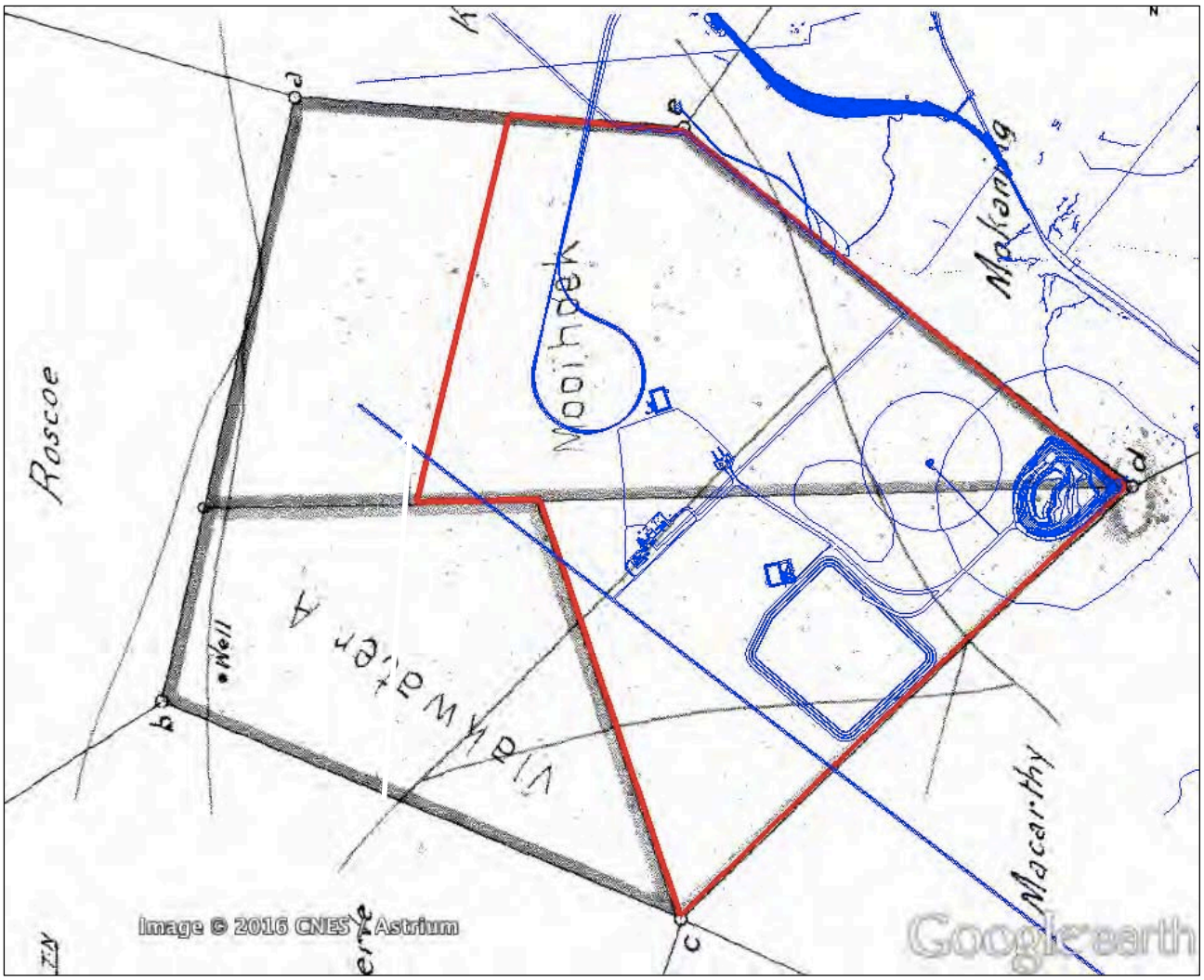


Figure 10 – Original survey diagram for the farm Jenkins that was surveyed in November 1897.

5.2 First Editions of the 2722DD and 2723CC Topographical Sheets, 1974

The figure below depicts combined sections of the First Editions of the 2722DD and 2723CC Topographic Sheets. Both map sheets were based on aerial photography conducted in 1972 and were surveyed in 1974. The following observations can be made from the map:

- Feature 1 - The Mooihoek farmstead and windmill are depicted here. The farmstead was identified during the fieldwork (see site JNK 2).
- Features 2, 3 and 4 – A "kraal", cluster of two buildings and the Jenkins farmstead are depicted here. These features are not located within any of the proposed development footprints.

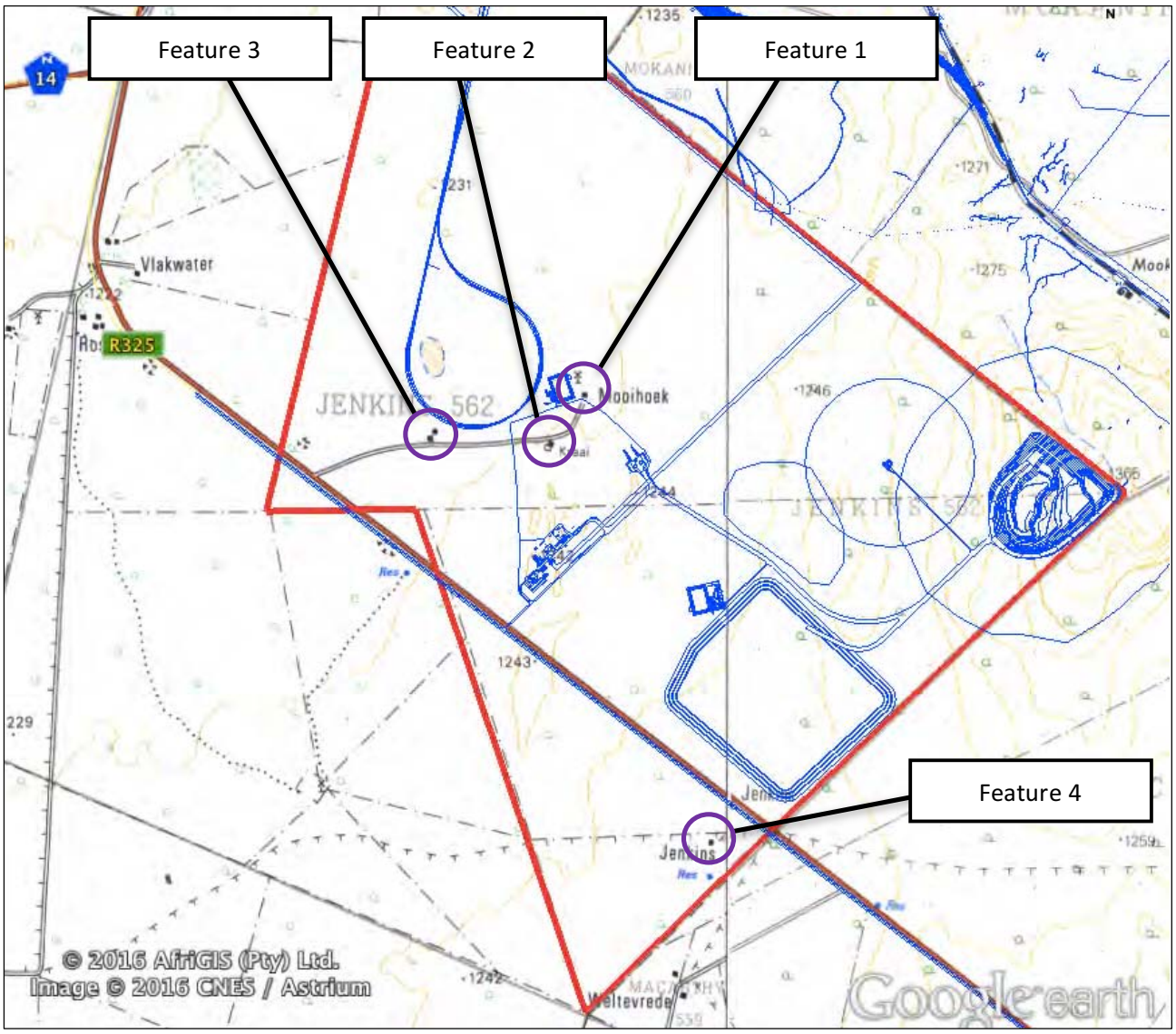


Figure 11 – Overlay of the proposed development footprints for Jenkins (in blue) over combined sections of the 2722DD and 2723CC Sheets. The Remainder and Portion 1 of the farm Jenkins are depicted in red.

5.3 Findings in terms of the Archival and Historical Maps

The following observations can be made as a result of the study of archival and historical maps of the study area:

- No buildings or structures appear to have been in existence at the time that the original survey diagram for Jenkins was surveyed in November 1893.
- At the time that the original survey diagram for Jenkins was surveyed, only a number of roads were located within the farm Jenkins. At present it is not clear whether these roads were main wagon roads (between for example Kuruman and Postmasburg) or merely secondary farm tracks. Nonetheless, no evidence for these roads could be identified in the field.
- The second page of the original survey diagram (not depicted in this report) indicates that the subdivision of the farm Jenkins took place between 1919 and 1921. On 12 February 1919 a portion of the farm Jenkins was transferred to J.J de Kock. This portion, which represents a significant section of the present study area, was at the time renamed Mooihoek (Chief Surveyor-General of South Africa). Secondly, on 8 December 1921, a second portion of the farm Jenkins was subdivided and transferred to S.N. Venter. This portion was named Vlakwater A.
- By 1974 a number of buildings are depicted within the Remainder and Portion 1 of the farm Jenkins. These include the Mooihoek farmhouse (identified in the field and discussed in this report as site JNK 2), a "kraal", cluster of two buildings and the Jenkins farmhouse. The depiction of these buildings on the maps indicates that all these buildings still in existence today, would be at least 41 years old.

6 ARCHAEOLOGICAL OVERVIEW AND FINDINGS

6.1 Overview of the Archaeological Fabric of the Study Area and Surroundings

A number of archaeological surveys and research projects have been undertaken in the general surroundings of the study area. The reason for this focus in archaeological work in the surrounding area particularly, is most likely due to the large scale manganese and iron ore mining activities taking place and the resulting requirement for archaeologists to assess the proposed mining areas as well as the well-known presence of pre-colonial mining, rock art and Stone Age sites from this general area.

With this as background, two main types of archaeological reports and publications were used to compile this overview. The first of these was the use of published literature, which primarily relates to archaeological research carried out by academic institutions such as museums and universities. It is important to note that the information listed here do not necessarily represent all the previous archaeological work undertaken in the vicinity of the study area.

The second source of information comprise reports that were accessed from the electronic database of the South African Heritage Resources Agency known as SAHRIS (South African Heritage Resources Information System), and which for the most part came about due to the requirement for archaeological and heritage impact assessments to be undertaken for mining and other development activities.

6.1.1 Archaeological Sites as Revealed Through a Study of Published Literature

In the section that follows, the known archaeological sites from the surroundings of the study area that were identified by studying archaeological journals and books, will be individually discussed. Each site description will also contain information on the approximate distance between the site and the present study area.

It is important to note that these sites are all located some distance from the present study and that no evidence for previous archaeological research from within the study area could be found.

The known archaeological sites from the surroundings of the study which have been researched, are as follows.

6.1.1.1 Kathu Archaeological Complex

Overview of the Kathu Archaeological Complex

The Kathu Complex sites contain important ESA Acheulian and transitional ESA/MSA Fauresmith assemblages (Beaumont, 1990, 2004, 2013; Herries, 2011; Chazan et al, 2012; Wilkins & Chazan, 2012, Walker et al, 2014). The presently identified sites making up the Kathu Archaeological Complex include the Kathu Pan Sites, Kathu Cemetery, Bestwood and Kathu Townlands.

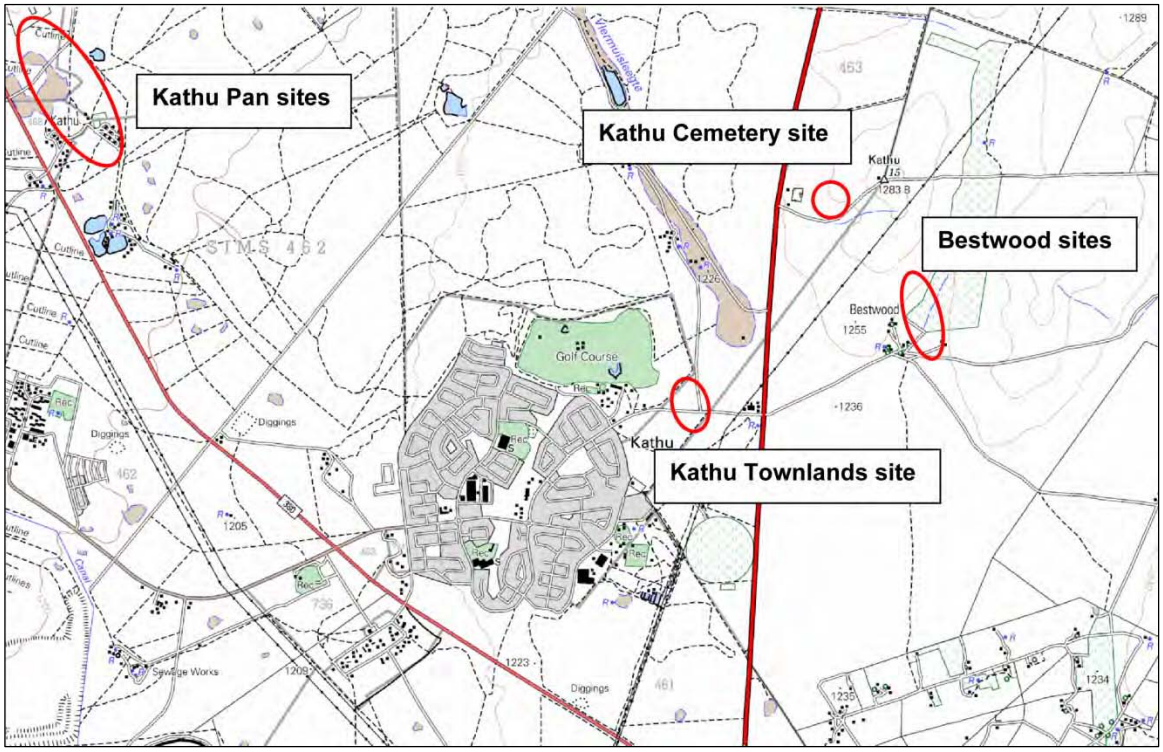


Figure 12 – This map depicts the positions of the sites collectively known as the Kathu Archaeological Complex .

Walker et al (2014) suggest that the intensive occupation of the Kathu region can be linked to the availability of water resources. Current research projects are yielding important data on typologies, lithic technologies, technological innovations, complex spatial organization and also dates for the ESA Acheulian and for the MSA assemblages. Research at Kathu Pan 1 established a date of 500 000 years for a Fauresmith blade assemblage where blades were systematically removed from prepared cores (Wilkens & Chazan, 2012). It is argued that some of these were used as speartips (Rots et al, 2014; Wilkins et al, 2015).

Archaeological and palaeoenvironmental data from Kathu Pan and Kathu Townlands were used to reconstruct changes over time in the prehistoric environment (Beaumont 2004b). Associated faunal remains with some of the Acheulian include *Elephas recki recki*. These animals disappeared at sites in East Africa such as at Olorgesailie, Kenya, at around 600 000/800 000 years ago (Beaumont, 2004b; McNabb, 2004). Biostratigraphy or faunal correlation is often used to date the southern African sites and gives some indication of the approximate age of some of the associated assemblages. More recently a combination of OSL and ESR/U-series dating (Porat et al, 2010; Herries, 2011; Walker et al, 2014) were used to date the transition to MSA tool forms. At Kathu Pan the transitional Fauresmith has been dated to ca. 500 000 BP (Porat et al, 2010). Kathu Pan is formed by a shallow depression with an internal drainage and a high water table.

The LCT's from this area often contain very fine handaxes with some superb examples produced on banded ironstone. Lithics in some of the Acheulian deposits, but also in MSA levels, display a shiny silica skin. At Kathu Townlands an outcropping of banded ironstone that covers a large area of around 25 km contains enormous quantities of flaked items. This phenomenon is ascribed to the use of the high-grade bedrock ironstone as a source for raw materials and is supported by the high incidence of handaxe roughouts (Beaumont 2004b). The prepared core technique was used to produce the spectacular small handaxes, long blades, convergent flakes/points, scrapers found in Fauresmith collections.

North-east of Kathu several newly-found ESA sites with LCT's and an associated range of tools occur in sand quarries and on a hilltop at Uitkoms Farm and the Bestwood locality (Chazan et al, 2012). The residential and commercial developments at Bestwood and close to the Townlands demonstrate the importance of Phase 2 heritage studies in the Kathu region.

The concerns that Walker et al (2014:8) raise with regard to the impact of the exponential development should feature in any survey that is undertaken around Kathu. With reference to the general locality they urge that a "*broader landscape-based effort of subsurface testing including palaeo-landscape and paleo-environmental reconstruction is essential to our understanding of this extraordinary record. Sources of this information must be protected along with archaeological remains. Together with the other components of the Kathu Complex, this site represents a high density of hominin occupation that presents a challenge to reconstructions of hominin adaptations during the Early-Middle Pleistocene*".

Orton and Walker (2015:12) in remarking on the significance of Kathu again emphasize '*that the area is best regarded as an archaeological landscape rather than a collection of individual sites*'.

Kathu Pan

Klein (1984) describes the Kathu Pan as the best paleoenvironmental sequence from the Kalahari Basin area. It is a broad surface of organic marshland that is located in the centre of four farms, namely Marsh 467, Sacha 468, Kathu 465 and Sims 462.

In the past, the pan would have been maintained by artesian seepage rather than surface waters (Klein 1984). Due to this, Butzer (1984) maintains that from a sedimentological perspective the Kathu Pan is unique. He points out that the long term ground water trends provide a filtered climatic record that affords unique evidence for protracted climatic intervals during the Pleistocene. The particular environment provided a range of subsistence resources as pointed out by Van Zinderen Bakker (1995: 101).

'*Since ESA times the water table at the pan has mostly been so high that, under natural conditions, it rises in summer above the peaty surface. This environment provided an oasis for prehistoric people and animals'*

However, since the extraction of ground water pumped to supply Kathu with water, the surface of this water body has not risen above the ground surface (Klein, 1984, Walker et al, 2013). The pumping activities revealed a covered karst in the calcrete substrate of the Kathu Pan. Klein (1984) explains that although calcrete is commonly found 2-3m below the surface, an 8m drop of the watertable due to excessive ground water extraction has led to compaction of the numerous doline fills with collapse and partial exposure of the sedimentary sequence.

In 1974 handaxes and faunal remains were discovered in the walls of a newly formed doline near the farmstead of then farm manager Naas Viljoen. Viljoen called the McGregor Museum when his children discovered the artefacts whilst playing in the doline (Walker et al, 2013).

The first archaeologist to conduct work on the Kathu Pan sites was A.J B. Humphreys on 13 August 1975. Subsequently, P.B. Beaumont conducted extensive studies in the vicinity. Beaumont began his initial research in the area just after he was appointed to the McGregor

Museum in 1978 (Walker et al, 2013). During this year several researchers visited the site. These included botanist Andy Gubb, pollen scientist Van Zinderen Bakker, Professor van der Merwe (University of Pretoria) as well as John Vogel (The Quaternary Dating Research Unit (QUADRU)).

In the article written by Walker et al (2013), the history of research on the pan is made clear. Walker et al (2013) describe the official excavations at the site referred to as KP1 in 1980 as this is where most research at the pan sites have been conducted. Excavations were then undertaken at KP1 – KP5 in 1982. In 1983 KP5, KP6 and KP7 were excavated. In 1984, surface collections were undertaken at KP11. In 1985 KP6 and KP8 were excavated and KP9 was excavated in 1990. Also in 1990, KP10 was mechanically dug, however no archaeological excavations were conducted. During 1990 to 2004 there was a gap in the research conducted in the area. Thereafter, Dr Chazan and other members of the research team on the Kathu Pan conducted further excavations and research at the site. It was through this extended research and a re-examination of previous work that KP1 was declared as a Grade 1 site in 2013.

In 1990 P.B. Beaumont created a schematic map, which depicts the localities and details of 11 sites within the Kathu Pan. The current team researching the site used this map and geo-rectified it atop the CDSM 1:50 000 map 2723CA (1972) in order to gain approximate GPS coordinates for each of the localities previously mapped by Beaumont. The coordinates of the sites as determined by Walker et al 2013 can be viewed in Table 10 below. A twelfth site is included that has been discovered by Walker et al but has not yet been investigated.

A buffer zone has not yet been established around the Kathu Pan sites. According to Walker et al (2013) a considerable amount of fieldwork still needs to be undertaken to clarify the extent of the deposit. They noted that while the sink holes have offered windows into the deposits around the pan, and some excavations around the 1980s have offered clues to the deposits outside the sink holes, the overall extent of what the Kathu Pan sites have to offer is unknown.

The Kathu Pan is an exceptionally significant landscape, one of the reasons being that the archaeological deposits contain both ESA artefacts and associated fauna in near primary context (Walker et al 2013). This is unusual as only seven southern African sites contain ESA artefacts and bones in primary context (Cave of Hearths, Wonderwerk, Pomongwe, and the open air sites of Elandsfontain, Mwanganda, Namib IV and Kathu Pan) (Volman, 1984). The

second reason for the high significance of Kathu Pan is that it also includes stratified deposits from the MSA. Walker et al point out that most MSA sites are along the coast and in caves or shelters, whereas there are MSA deposits in an open-air setting in the interior at Kathu.

In conclusion, the Kathu Pan sites are of considerable significance due to the unique geology and formation of the dolines, which could be considered as windows into the past. Kathu Pan Site 1 contains a near perfect stratigraphy of the ESA, MSA and LSA that provides the best paleoenvironmental sequence from this area as well as a useful guide to archaeological events.

Kathu Pan is located 25.3 km north of the study area, Kathu Townlands 23.9 km north-east of the study area and the Bestwood sites 25.4 km north-east of the study area.

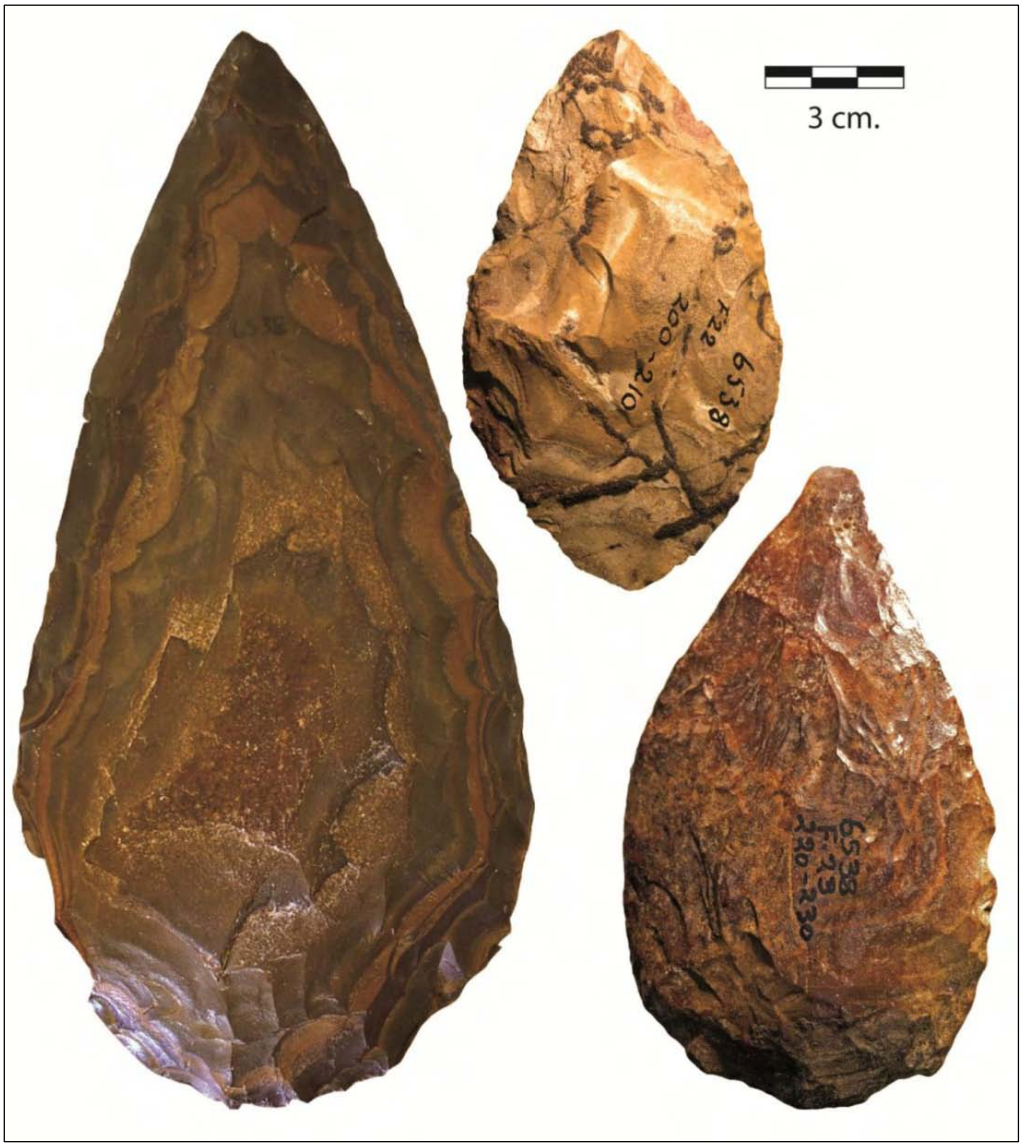


Figure 13–Three handaxes recovered from the Kathu Pan sites (Walker et. al. 2013:15).

6.1.1.2 Blinkklipkop

Blinkklipkop is arguably the most significant archaeological and historical site in the vicinity of Postmasburg. It is located roughly 5km north-east of the town of Postmasburg, and is situated on the farm Postmasburg.

The site comprises a pre-colonial specularite mine located in a hill known as Blinkklipkop (or Gatkoppies). Specularite is a "...*crystalline form of hematite that is steel grey/iron-black in colour with a silvery sparkle*..." (Thackeray et.al., 1983:17) and which was much prised as a cosmetic by the different pre-colonial cultures of the area.

The presence of the site had been known since the early historical times, and European explorers and travellers such as the German explorer Martin Hinrich Carl Lichtenstein in 1805 and the well-known artist and traveller William Burchell in 1812.

At the time, the specularite mine was interpreted by these and other visitors as associated with Kora and Tswana groups. However, the archaeological research undertaken by A.I. Thackeray, J.F. Thackeray and P.B. Beaumont between 8 and 25 April 1980 provided much older origins for the site (Thackeray et.al., 1983).

The archaeological excavations revealed a large number of lithics (stone artefacts) which included mining tools as well as scrapers; ostrich eggshell fragments and beads; pottery; glass beads as well as faunal remains (Thackeray et.al., 1983).

The archaeological research has revealed that mining activities at the site likely commenced before roughly 800 AD, and that before the 17th century these mining activities were undertaken by Khoi herders and possibly San hunter gathers with Late Iron Age Tswana pastoralists also in all likelihood involved thereafter (Thackeray et.al., 1983).

Blinkklipkop is located 41.7 km south-east of the present study area.

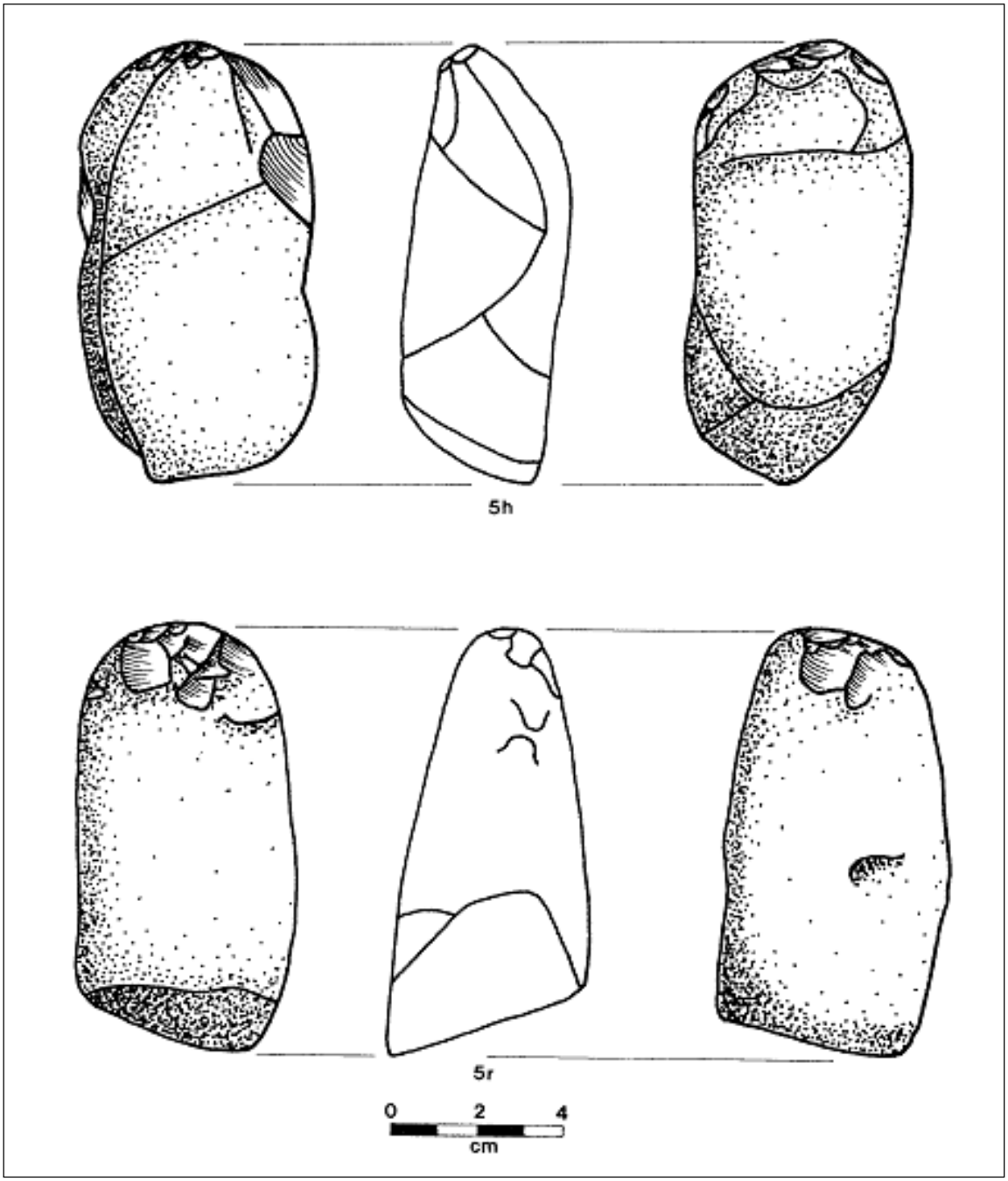


Figure 14 – Examples of mining-related lithics from Blinkklipkop (Thackeray et.al., 1983:20).

6.1.1.3 Doornfontein

During 1973 archaeological research was undertaken by P.B. Beaumont and A.K. Boshier on a pre-colonial specularite mine located in a slight rise in an area known as Jonas Vlakte on the farm Doornfontein 446. The farm is located 6.8 km north-west of Postmasburg (Beaumont & Boshier, 1974). The archaeologists identified four chambers at the site, and excavated two trenches located within Chamber 3. The archaeological collection excavated from the site included a large number of lithics of which typical mining tools such as hammer stones were particularly evident; ostrich eggshell fragments and beads; decorated and undecorated pottery, metal artefacts which included an iron spear head and a copper strip bead; bone artefacts such as an arrow point and possible pendant as well faunal remains. Interestingly, human remains were also excavated from the site (Beaumont & Boshier, 1974). Radiocarbon dates obtained from the excavations indicated that mining activities at this site commenced in approximately 830 AD (Beaumont & Boshier, 1974) which is roughly contemporary with the dates obtained from Blinkklipkop.

<u>Doornfontein is located 27.5 km south-west of the present study area.</u>

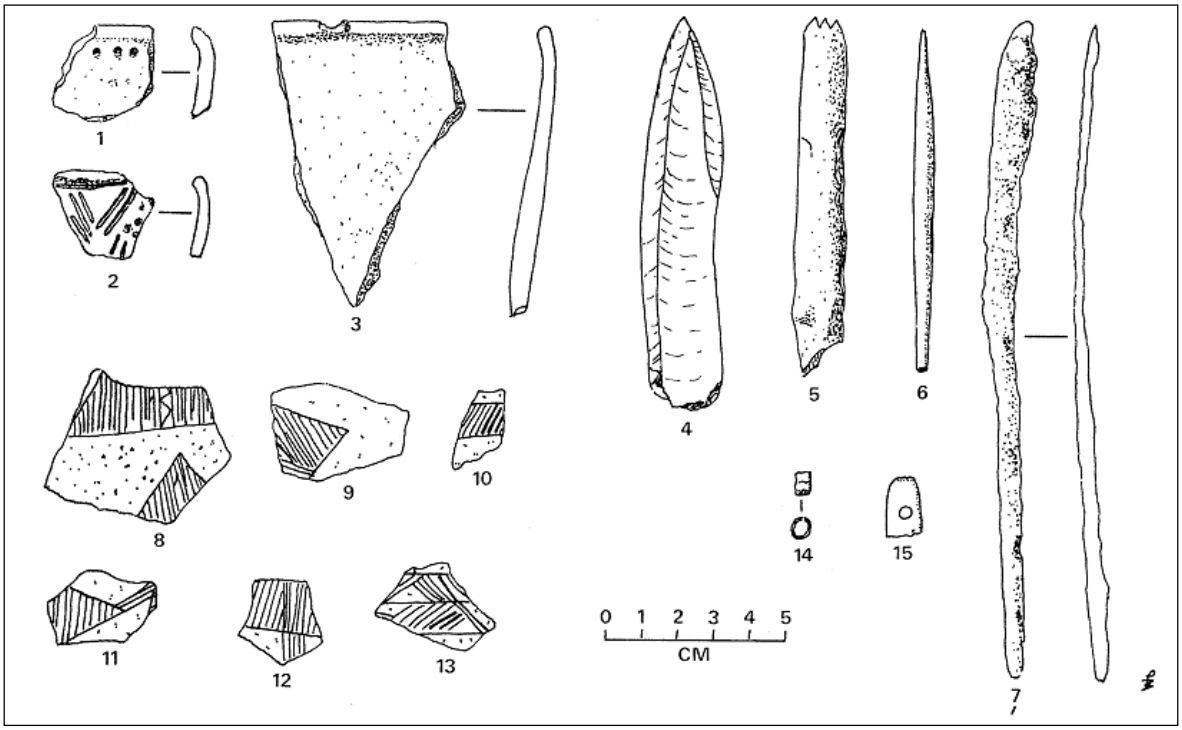


Figure 15 – Non-lithic artefacts from the excavations at Doornfontein (Beaumont & Bashier., 1983:42). Caption numbers 1, 2 and 3 are potsherds; numbers 4, 5 and 6 are bone artefacts (including a bone arrow point); number 7 is a iron spear head; numbers 8, 9, 10, 11, 12, and 13 are decorated ostrich eggshell fragments with numbers 14 and 15 interpreted as a copper strip bead and possible broken bone pendant.

6.1.1.4 Beeshoek

The farm is located 5.4km north-west of Postmasburg. The rock art at Beeshoek had been known from some time (Wilman, 1933) (Fock, 1969) (Judner & Judner, 1969) and comprises petroglyphs of various animals such as giraffe, ostrich, elephant, kudu as well as some animal foot prints. A number of examples of geometric symbols are also found at the site (Judner & Judner, 1969).

While the exact position of the rock art site at Beeshoek is not presently known, the farm Beeshoek is located approximately 36 km south of the present study area.

Figure 16 – Photograph depicting some of the rock engravings at Beeshoek (Cairncross et al., 1997:31).

6.1.1.5 Paling

The farm is located 12 km north-west of Postmasburg. Beaumont and Boshier (1974) refer to the presence of a rock art site as well as a pre-colonial specularite mining site on the farm Paling. Although no further information with regard to the mining site is provided, Beaumont and Boshier (1974) state that the rock art site comprises geometric and naturalistic depictions which includes a giraffe. Furthermore, graffiti from the 1920s were also observed here.

While the exact position of the rock art site at Paling is not presently known, the farm is located 22 km south of the present study area.

6.1.1.6 Gloucester

The farm is located 22 km north of Postmasburg. Beaumont and Boshier (1974) refer to the presence of a pre-colonial specularite mine here.

While the exact position of the pre-colonial mining site at Gloucester is not presently known, the farm is located 13.8 km south-east of the present study area.

6.1.1.7 Mount Huxley

The farm is located 24.6 km north-east of Postmasburg. Beaumont and Boshier (1974) refer to the presence of a pre-colonial specularite mine here.

While the exact position of the pre-colonial mining site at Mount Huxley is not presently known, the farm is located 16.1 km south-east of the study area.

6.1.1.8 Wonderwerk Cave

Wonderwerk Cave is located 44km south of Kuruman. Its palaeontological and archaeological significance was first realised by B.D. Malan, Basil Cooke and Laurie Wells more than 60 years ago. Karl Butzer carried out excavations at the site between 1974 and 1977, while Peter Beaumont, Anne Thackeray and Francis Thackeray conducted fieldwork during 1978 and 1979. Their work recovered Later Stone Age fauna, lithics and rock engravings. During 1980 Peter Beaumont continued his work at the cave, and his findings at the time included Early Stone Age deposits. More recently, work has been undertaken at the cave by Michael Chazan of the University of Toronto and Liora Kolska Horwitz of the Hebrew University (Bamford & Thackeray, 2009).

The Wonderwerk Cave is located 52.9 km east of the study area.

6.1.2 Archaeological Sites as Revealed Through a Study of the SAHRIS Database

Researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that a number of previous archaeological and heritage studies were carried out in the immediate surroundings of the present study area, with some studies even overlapping the present study area. For the purposes of this study, an attempt was made to access all the reports dealing with study areas falling within a distance of 15 km from the present study area.

An interrogation of the SAHRA APM Report Mapping Project records as well as the SAHRIS online database have shown that one previous study was undertaken within the farm Jenkins. The details of this study is outlined below.

- **Webley, L. & Halkett, D. 2010. Archaeological Impact Assessment: Proposed Prospecting on the Farm Jenkins 562 (East), Postmasburg, Northern Cape. Archive File Reference: 9/2/074/0001.**

  This study was commissioned by Coza Mining (Pty) Ltd to conduct an Archaeological Impact Assessment for their prospecting application for iron and manganese ore on the eastern corner of the farm Jenkins 562.

  Webley & Halkett indicate that recent work by them in the Kathu area confirm the distribution of Middle Stone Age and Later Stone Age artefacts in calcrete deposits around pans and springs. During the 2010 survey, two Later Stone Age flakes were identified on a rocky ledge above a dry river bed on the farm. No other significant heritage resources were identified in this study area.

  The two Later Stone Age flakes identified by the authors on a rocky ledge above a dry river bed, is located 94 m from the rock art site identified during the present fieldwork (see site JNK 6).

A number of previous studies are also known from the immediate surroundings of the study area. These previous studies are all within 15 km of the present study area, and are discussed in chronological order below.

- **Morris, D. 2001. Report on assessment of archaeological resources in the vicinity of proposed mining at Morokwa. Archive File Reference: 9/2/055/0002.**

  The fieldwork undertaken for this study identified one site, namely a small scatter of stone tools manufactured from fine-grained jaspilite. These lithics were determined to be Middle Stone Age. No other significant resources were observed during the fieldwork.

  The farm Morokwa is located 4.3 km south-east of the present study area.

- **Morris, D. 2005. Report on a Phase 1 Archaeological Assessment of proposed mining areas on the farms Bruce, King, Mokaning and Parson, between Postmasburg and Kathu, Northern Cape. Archive File Reference: 9/2/055/0002.**

  The report outlines known information regarding archaeological sites from its study area and surroundings, including the following:

  - 11 known Stone Age sites from the farms Bruce, Kathu, Uitkoms, Sishen, Demaneng, Lylyveld and Mashwening.
  - 5 known Middle Stone Age sites from the vicinity of Kathu.
  - 10 known Later Stone age sites from the farms King, Mashwening and Kathu.
  - 3 known Iron Age sites from the farms Demaneng, Lylyveld and Kathu.
  - Rock Engravings from the farms Sishen, Bruce and Beeshoek

  The fieldwork undertaken for the study yielded a number of significant archaeological sites, none of which was expected to be impacted upon by the development. These sites include the following:

  - Three cemeteries as well as a Middle Stone Age site comprising high densities of flakes and prepared platforms were identified on the farm Parson.
  - One cemetery, one Iron Age site and one Middle Stone Age site were identified on the farm King.
  - Various Stone Age scatters were found on the plains of the study area, though none of these scatters were deemed to be of any significance.

  The farm King is located immediately to the north of the Jenkins and the study area, whereas the farm Parson is located 1.4 km west of the study area.

- **Morris, D. 2008. Archaeological and Heritage Phase 1 predictive Impact Assessment for prospecting on Magoloring Portions 4 & 5 (Japies Rust), near Glosam, Northern Cape. File reference: 9/2/055/0002.**

  The fieldwork results include a shelter (possibly Middle Stone Age) with some flakes, cores and a few ostrich eggshell pieces. Furthermore, Middle Stone Age and Later Stone Age artefacts were found in dispersed scatters in the valley. No historic features or sites were identified during this study.

  The farm Magoloring is located 13.7 km south of the present study area.

- **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. SAHRA Case Number: 7254.**

  The fieldwork undertaken for the study yielded a number of findings, including the following:

  - Four findspots of Stone Age material were identified, including a core with four irregular flakes detached, a heavily weathered / abraded irregular andesite flake, an irregular red jasper flake and a blade distal portion of foreign jaspelite.
  - A store-room, which might be older than 60 years, was observed.
  - A cemetery comprising six graves.

  The farm Lomoteng is located 6.7 km south of the present study area.

- **Magoma, M. 2013. Phase 1 Archaeological Impact Assessment Specialist Study Report for the Proposed Development of Prospecting Rights of Iron Ore and Manganese on remaining extent of Mashwening 557 in Kathu, within the Local Municipality of Gamagara, John Taolo Gaetsewe District, Northern Cape. Case Id: 3955.**

  The author of the report was appointed by Wide Investment 100 (Pty) Ltd to conduct a study for the proposed prospecting right on the remainder of the farm Mashwening 557. The fieldwork identified low density scatters of stone tools at two different localities from within the study area as well as several structures dating to the historic period. These structures were primarily farmhouses and farming-related structures.

The farm Mashwening is located 5 km north-east of the present study area.

6.2 Findings in terms of the Archaeological Overview

The archaeological overview provided above clearly shows that the study area is located in a landscape with a wide array of archaeological resources. As such, the study area has the potential to contain any of a number of archaeological and heritage sites, including the following:

- Early Stone Age findspots and sites
- Middle Stone Age findspots and sites
- Later Stone Age findspots and sites
- Rock Art Sites
- Pre-colonial Specularite Mines
- Historic Mining Sites
- Historic Farmsteads
- Graves and Cemeteries

The significance of the study area within its historic setting will be outlined and discussed.

7 HISTORICAL OVERVIEW AND FINDINGS

7.1. Historical Overview

DATE	DESCRIPTION
2.5 million to 250 000 years ago	The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago. A number of important ESA sites are known from the wider surroundings, including the very significant Kathu Pans (25.3 km north of the study area), Kathu Townlands (23.9 km north-east of the study area) and also the Bestwood sites (25.4 km north-east of the study area) (Chazan et al, 2012) (Walker et al, 2014). Research at Kathu Townlands was first undertaken by P.B. Beaumont (1990, 2004). The locality has a remarkable high lithic density containing millions of ESA artefacts (Mitchell, 2002; Walker et al, 2013 Walker et al. 2014). Moreover, the interface between the ESA and MSA is also represented at Kathu Pan by the transitional lithic industry of the Fauresmith (Porat et al 2010).
250 000 to 40 000 years ago	The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley 2013). Middle Stone age sites and occurrences had been identified in the direct vicinity of the study area, including the very significant Kathu Pan localities (Wilkins & Chazan, 2012). See also, for example, Beaumont (2009) and Kruger (2014).
40 000 years ago to the historic past	The Later Stone Age (LSA) is the third archaeological phase identified and is associated with an abundance of very small stone tools known as microliths. According to Beaumont (2000) pecked engravings, originally from the farms Sishen 543 and Bruce 544, were donated to the McGregor Museum with some engravings located on the grounds of the Sishen Iron Ore Mine as well. These two farms are situated approximately 7.9 km to the north of the study area. More engraving sites are known from further afield, including one on the farm Palingpan, which is located 21.5 km south-east of the present study area.
800 AD – 820 AD	The archaeological excavations undertaken by Beaumont & Boshier (1974) and Thackeray et al (1983), revealed that the mining of specularite at Doornfontein and Tsantsabane/Blinkklipkop commenced during this time. Blinkklipkop, for example, is located approximately 41.7 km south-east of the study area.

	During this initial period the mining activities would have been undertaken by San hunter-gatherers and Kora pastoralists. Only after the 17th century were such mining activities likely also undertaken by the Iron Age Tswana groups.
Early 1600s	The Tswana groups known as the Thlaping and Thlaro moved southward into the area presently known as the Northern Cape. A century later they were settled in areas as far south as Majeng (Langeberg), Tsantsabane (Postmasburg) and Tlhaka le Tlou (Danielskuil) (Snyman, 1986). In terms of the Thlaro specifically, Breutz (1963) states that after they broke away from the Hurutshe during the period between 1580 and 1610, the Thlaro travelled along the Molopo River and the Southern Kalahari before arriving at the confluence of the Kudumane, Mosaweng and Molopo. From here they established themselves at Tsowe (west of Morokweng), Gatlhose (8 km east of the study area), Majeng (Langberg), Khoiise (Khuis on the Molopo River) and Tlhaka-la-Tlou (present day Danielskuil) (59.5 km south-east of the study area). It is evident that the study area and surrounding landscape would be been located on the southern periphery of the overall settlement area of these two Tswana groups at the time. In fact, the surroundings of the study area were to become the southern edge of Late Iron Age expansion into the Northern Cape, a fact which was later signified by the establishment of the boundary between Griqualand West and British Bechuanaland a short distance south of the present study area.
c. 1770	During this time the Kora moved into the area. Due to their superior firearms they applied increasing pressure on the Thlaping and Thlaro groups. In the end, the Thlaping moved in a north-eastern direction to settle in the general vicinity of Dithakong, north-east of present-day Kuruman. The Thlaro settled in areas to the west and north-west of the Thlaping (Snyman, 1986).
c. 1786 – c. 1795	During this time a German deserter by the name of Jan Bloem established himself at Tsantsabane (Blinkklip) (Legassick, 2010). This place is located 5km north-east of the present-day town of Postmasburg. The settlement of Jan Bloem at the specularite mine may have been a way in which to control the valuable site and any trading activities associated with it.
c. 1795	Legassick (2010) confirms the presence of the Thlaping, Thlaro and Kora in the general vicinity of the study area during this time. This said, the study area and surrounding landscape would have represented a southern peripheral area of the overall landscape occupied by especially the Thlaping and Thlaro groups at the time. From a map depicted in Leggassick (2010:338) it is evident that at the time the Kora started moving in north-eastern direction from the areas along the central Orange river to the banks of the Harts River.
Early 1800s	After the threat of the Kora became less intensive, the Thlaping moved to the vicinity of present-day Kuruman. The Thlaro returned to the Langeberg, establishing them on a permanent basis there during the 1820s (Snyman, 1986). The settlement of the Thlaping in the vicinity of Kuruman occurred during the reign of Molehabangwe. This period in the history of the Thlaping was seen as a period of wealth and power, and at the time they even had control of the

	sibello quarry near Blinkklip (Legassick, 2010), roughly 41.7 km to the south-east.
1801	The first known visit to this area by European explorers (i.e. excluding European renegades and fugitives such as Jan Bloem) took place in 1801. The journey was undertaken by P.J. Truter and Dr. W. Somerville. They crossed over the Orange River in the vicinity of Prieska, and passed Blinkklip on their way to present-day Kuruman (Bergh, 1999). Although their exact route is not known, it is possible that their journey from present-day Postmasburg to Kuruman would have passed some distance to the east of the present study area.
1802 - 1813	During this year William Anderson and Cornelius Kramer, both of the London Missionary Society, established a mission station at a place called Leeuwenkuil. The focus of their work was a group known as the Bastards (Erasmus, 2004). This group could be described as a cultural conglomeration descending not only from relationships between different cultures and races (i.e. European and Khoi), but also comprised remnants of Khoi and San groups as well as freed slaves. The particular group later became known as the Griqua. Due to the problems caused by the presence of lions at Leeuwenkuil, the mission station was moved in 1805 to a place higher up called Klaarwater. On 7 August 1813 the name of the settlement which had sprung up at Klaarwater was renamed Griquatown. This came about as a result of a number of proposals made by Reverend John Campbell, the Director of the London Missionary Society who was visiting the mission stations from this area at the time. He suggested that "...*the Bastards change their name to 'Griqua' and that Klaarwater became Griquatown. This was because 'on consulting among themselves they found a majority were descended from a person of the name Griqua'*..." (Legassick, 2010). Griquatown is located 103.7 km south-east of the present study area.
1805	During this year German explorer Martin Hinrich Carl Lichtenstein travelled through the general vicinity of the study area. After crossing the Orange River in the vicinity of present-day Prieska, Lichtenstein's party visited present-day Danielskuil, and by June 1805 they were at Blinkklip (Postmasburg), a well-known source for obtaining specular haematite. Archaeological investigations at Blinkklipkop (also known as Nauga) established a date of AD 800 for the utilization of this particular rich source (Thackeray, et al 1983). From here they travelled further north and reached the Kuruman River where they met Tswana-speaking people. They followed the river downstream for three days, after which they followed a tributary to reach Lattakoe. From here they turned south and reached the Orange River on 11 July 1805. While on their way to the Kuruman River (and to the south thereof), Lichtenstein and his fellow travellers visited a small settlement consisting of "*…about thirty flat spherical huts.*" Although the people who stayed here were herdsmen who looked after the cattle of richer people living on the Kuruman River, they indicated that San (Bushmen) were also present in the area (Lichtenstein, 1930). Although Lichtenstein was certainly not the first European explorer to travel through this area (the Truter & Somerville expedition had for example passed

	through this area in 1801), or for that matter the last (Burchell travelled through the area in 1811 followed by John Campbell in 1813) (Bergh, 1999), he did leave behind a written record of this journey providing a valuable glimpse into the early history of the general surroundings of the study area. What is also significant about the visit of Lichtenstein is that his journey took him from present-day Postmasburg to a place known as Tsenin, which is located north-west of Kuruman. As a result he would have passed in close proximity to the present study area.
1811 - 1813	During this period the famous English explorer and artist William Burchell visited the general vicinity of the study area. Accompanied by missionary Anderson, Burchell crossed over the Orange River at Little Bend from where they travelled to Klaarwater. Using the settlement as a temporary base, Bruchell undertook numerous journeys which included one which passed through Blinkklip (Bergh, 1999).
1813	In 1813 John Campbell of the London Missionary Society visited the general vicinity of the study area. He arrived at Klaarwater on 9 June 1813, where he rested for a few days before continuing in a northern direction toward present-day Kuruman, passing through Blinkklip on the way (Bergh, 1999).

Figure 17 - Reverend John Campbell (Campbell, 1815). He paid a visit to Blinkklip during the second half of 1813.

20 December 1820	On 20 December 1820, Andries Waterboer was elected leader of Griquatown. He succeeded Barend Berends as leader of the Griqua (Legassick, 2010). This period saw fission within the Griqua community of Griquatown, which led to two leaders and their followers moving from Griquatown to establish autonomous settlements. Berend Berends moved to Danielskuil (59.5 km south-east of the study area), whereas Adam Kok II established himself in the vicinity of Campbell (120 km south-east of the study area) (Legassick, 2010).
1820s	During the 1820s, Barend Barends and his followers moved from their settlement at Danielskuil to Boetsap. Boetsap is located roughly 141 km east of the study area. During the same period, Mothibi, the Thlaping ruler and brother of Mahura, settled in the vicinity of Boetsap before moving to Griquatown (Legassick, 2010). The first settlement of Blinkklip by the Griqua also took place during this time (Legassick, 2010).
1821 – August 1828	During this period another group of Griqua became dissatisfied with Waterboer, and moved away from Griquatown to settle along the Modder River. This group was known as the Bergenaars, and they were supported by Kora and San elements (Cope, 1977). A section of the Bergenaars known as the Klein Bergenaars (Little Bergenaars), subsequently settled along the Langberg. This mountain range is located roughly 40km west of the present study area. The Bergenaars constantly attacked the Thlaro, Thlaphing and Griqua. On three separate occasions (late 1824, July 1827 and December 1827) they attacked Griquatown itself. The Bergenaars also attacked the London Missionary Society station at Kuruman on several occasions. The last recorded attack on the mission station took place in August 1828 (Cope, 1977).
1824	Robert Moffat of the London Missionary Society established the mission station at Kuruman (Erasmus, 2004). The mission station is located 68 km north-east of the present study area.
Early 1830s	During the early 1830s, Andries Waterboer stationed a number of Griqua families at fountains north of Tsantsabane (Blinkklip) as well as at Daniëlskuil (Legassick, 2010). Shortly thereafter, a missionary of the London Missionary Society by the name of John Baillie was transferred from the mission station at Kuruman to Tsantsabane. He was sent to the present-day surroundings of Postmasburg to work among the Sotho-Tswana communities living in and around that area at the time. John Baillie subsequently left the mission station and resigned from the London Missionary Society in 1836 (Legassick, 2010).
22 April 1842	On this day a treaty was signed between Griqua leader Andries Waterboer and Thlaping leader Mahura at Mahura's settlement near Taungs.

22 April 1842	The agreement included a definition of the boundary between the two groups. The section of the agreed upon boundary closest to the study area ran from "...*the northerly point of the Langeberg and extending a little south of Nokaneng, and further half-way between Maremane and Klipfontein*..." (Legassick, 2010:291). While the exact location of Nokaneng is not currently known, the farm Klipfontein 437 is situated roughly 23 km south-east of the present study area, whereas the farm Maremane 678 is located 11.1 km to the south-east. This suggests that the present study area was located a short distance north of the boundary line between the Griqua and the Thlaping as defined in the treaty. As such, the study area was defined within this treaty as forming part of the land of the Thlaping. However, it must be noted that this boundary line was not cast in stone. This boundary was very similar to an earlier one that was thought to have been agreed to during the 1820s as a boundary between the Griqua and the Thlaping (Legassick, 2010).
1850	During this time a Thlaro leader by the name of Molete and his baThlaro baga Keakopa followers moved away from the Korannaberg and established themselves at Gathlose, roughly 8 km east of the study area. Breutz (1963) states that the land around Gathlose and Maremane used to belong to the Kora (Koranna) people and that they gave permission to Molete to settle here. After his death between 1885 and 1890, Molete was succeeded by Holele who ruled until his death during the Langberg Rebellion of 1897. Holele was succeeded by Kebiditswe John Holele and filled the post until 1912 when he was succeeded by his younger brother Kgosieng. Kgosieng ruled until he was pensioned on 28 February 1937, and was succeeded by Kebiditswe's son, Kgosietsiele Smous. Kgosietsiele died on 30 June 1956 and was succeeded by his son Frank Motsewakgosi Holele (Breutz, 1963). At roughly the same time (likely between 1850 and 1860) the area known as Maremane (located directly south of Gathlose) was an outpost grazing area of the BaThlaro chief Makgolokwe and his son Toto. The first designated leader of this area was Isaak Thupane Thupane, followed by Toto's son Robanyane who fled to present-day Namibia after the Langberg Rebellion of 1897. He was succeeded by his father's brother Jan Molebane Toto. However, the government only recognised him as chief in 1912 up to which point John Holele of the Gathlose Reserve was appointed by the government to act for the Maremane area as well. Molebane was dismissed in 1925 and was succeeded in 1926 by his brother David Makgolokwe. David Makgolokwe remained at his post until his death in 1942 when he was succeeded by Puso Togelo who remained as leader until his death in 1954. He in turn was succeeded by Felix Kgosithebe Toto (Breutz, 1963).
1850 - 1855	During this period a Thlaro chief by the name of Isaak Thupane Thupane established himself at Logageng (Gatkoppies) near Postmasburg. He subsequently moved with his followers to Groenwater 453. During the time that Thupane was living at Logageng, Kgangeng discovered the fountain at Metsematale. Subsequently, the land was ceded by Waterboer to the Thlaro and Kgangeng and his followers settled at Groenwater as well. Kgangeng was succeeded by Piet Selo in 1897, followed by Sebubi Daniel Selo on 7 February 1908, Leu Motshabeng in 1921 and Sebopelo Cornelius Kweetsane in 1927, Steenbok Kgangeng in 1935 and David Mosimanethebe Kweetsane in 1959 (Breutz, 1963).

	The farm Groenwater 453 is located 40.1 km south-east of the present study area.
13 December 1852	After the death of Andries Waterboer, his son Nicolaas Waterboer became the leader of Griquatown. He ruled Griquatown until the annexation of the area by the British in 1871 (see below) (Legassick, 2010). It was during the rule of Nicolaas Waterboer that diamonds were discovered in the area which led to a period of claims and counter-claims between the Griqua, the Orange Free State as well as the Zuid-Afrikaansche Republiek and which eventually led to the annexation of the area.

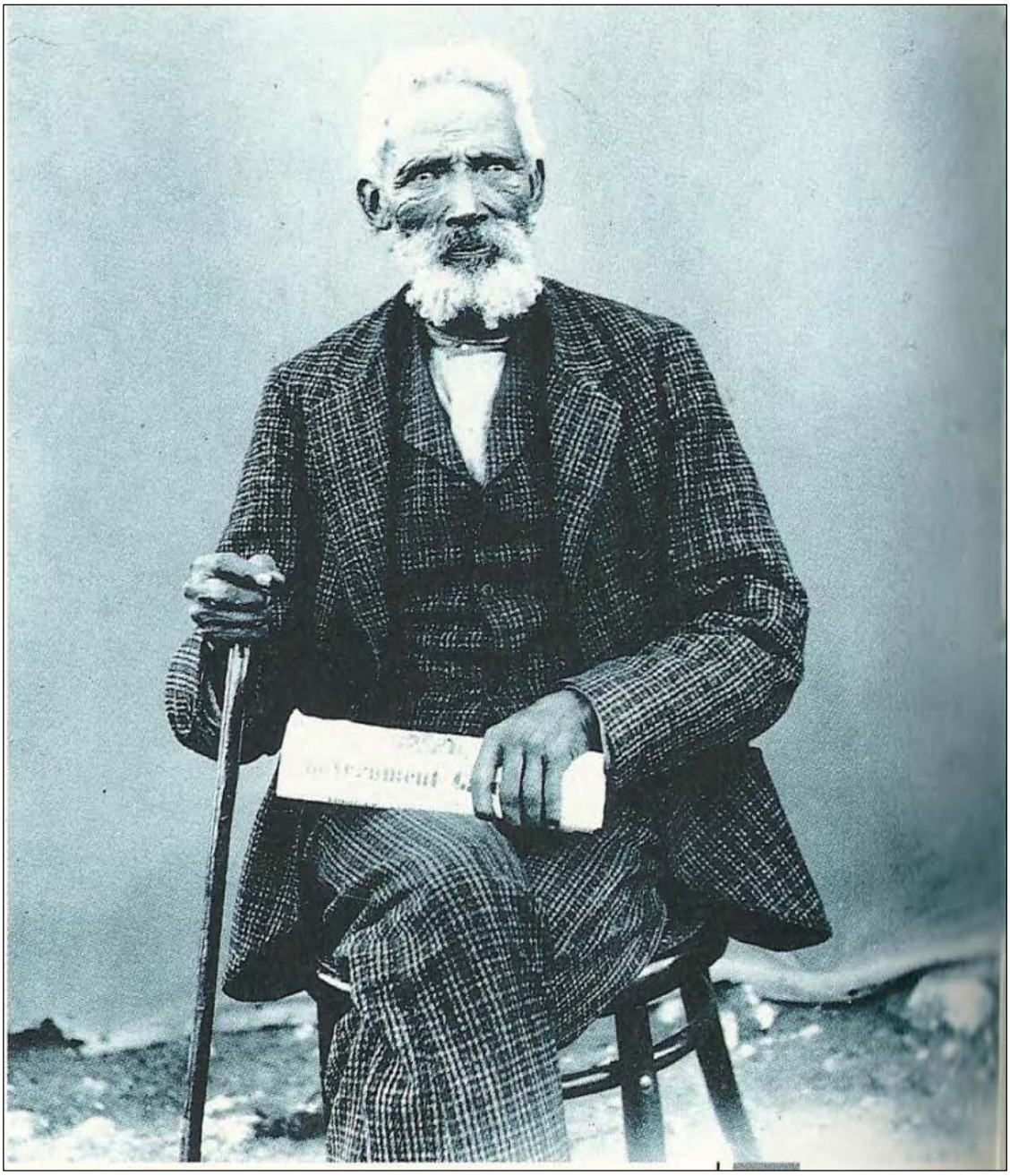


Figure 18 - Nicolaas Waterboer, who succeeded as leader of Griquatown in 1852 after the death of his father Andries Waterboer (Reader's Digest, 1994:168).

Before 1856	During the period before 1856 the Thlaro leader Masibi occupied the area known as Skeyfontein. Skeyfontein is located 56 km south-east of the study area.
1867	Diamonds were discovered for the first time in South Africa near Hopetown. Alluvial diamonds were also discovered along both banks of the Orange River (Van Staden, 1983).
27 October 1871	The area located in general terms between the Orange and Vaal Rivers and south of Kuruman was proclaimed as British Territory and named Griqualand West (www. wikipedia.org). The study area fell outside and to the north of this territory at the time.

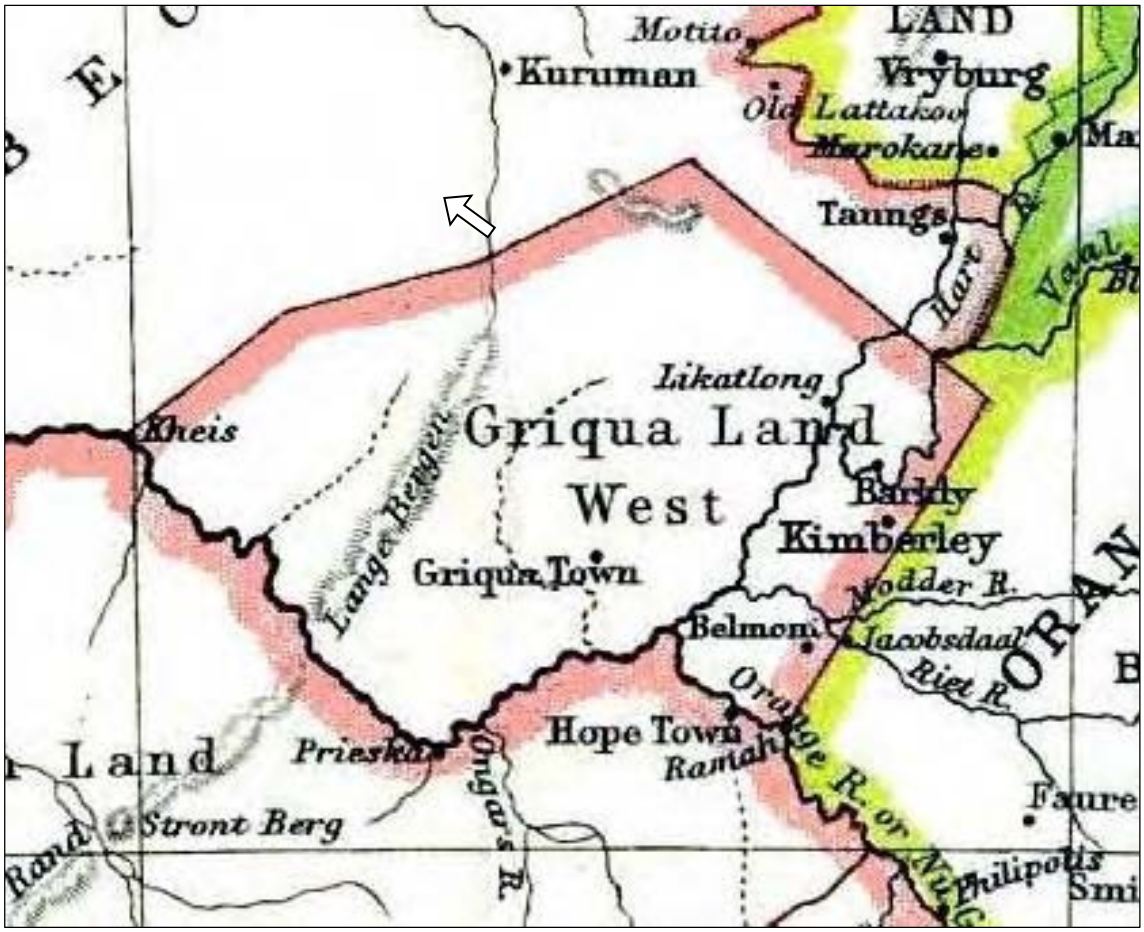
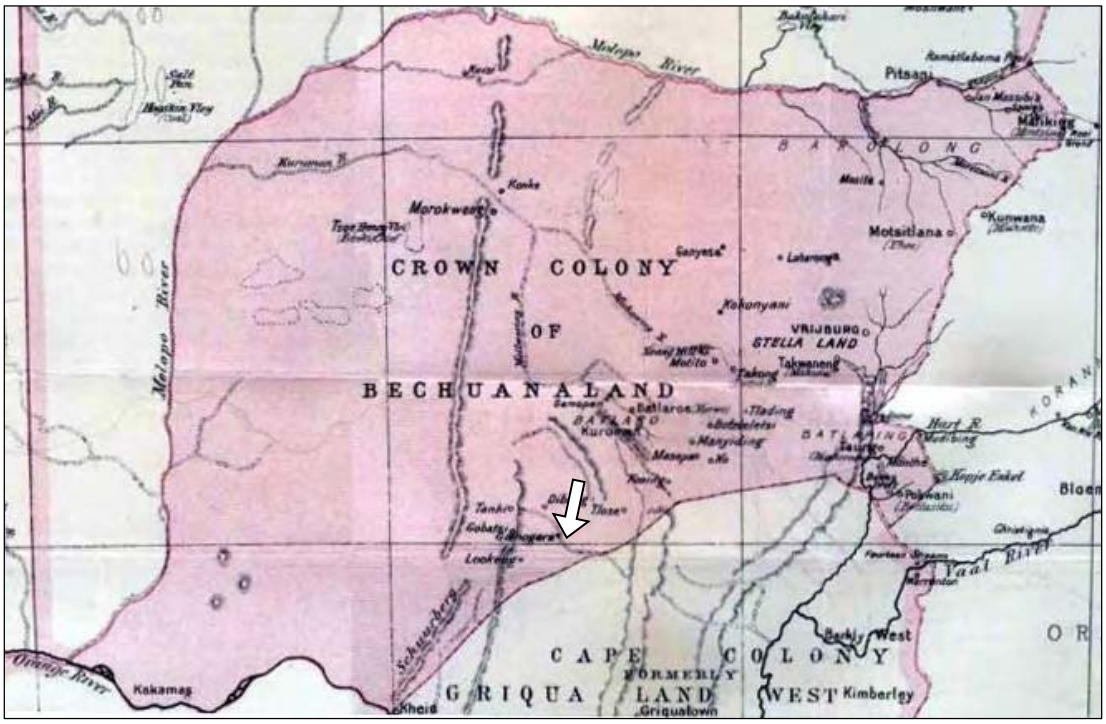


Figure 19 - Section of a map titled "Sketch Map of South Africa showing British Possessions". The map is dated to July 1885. (www.wikipedia.com).The boundaries and position of Griqualand West is depicted on this figure. The approximate position of the present study area

1878	A rebellion broke out amongst some of the Tswana communities living in Griqualand West. This rebellion, which was a response to British expansion and colonialism, spread to the Langberg. A British force left Griqualand West in October 1878 and defeated the "rebels" at the Langberg (Snyman, 1986).

30 September 1885	Sir Charles Warren proclaims the area between the Molopo River and the northern boundary of Griqualand West, as the Crown Colony of British Bechuanaland. Its western boundary was defined by the Molopo River and its eastern extremity reached as far as Mafeking. This proclamation followed on a military operation under Warren's command to occupy the Boer Republics of Stellaland and Goosen. As a result, the Crown Colony of British Bechuanaland included the lands of the two republics as well as the land of various Tswana groups (www.wikipedia.org). At the time, the study area was located near the southern boundary of this newly proclaimed territory.
 *Figure 20- Section of a map titled "Sketch Map of British Bechuanaland" which is dated to May 1887 (www.wikipedia.com) (www.kaiserscross.com). The approximate position of the study area is shown by the arrow.*	
1886	As a result of the work of a commission appointed by the British rulers of the Crown Colony of British Bechuanaland, a number of so-called "native reserves" were established in the general surroundings of the study area. These included Deben (34.6 km north-west of the study area), Gatlhose (8 km east of the study area), Maremane (9.9 km south-east of the study area), and Kathu (22.6km north of the study area). However, the largest of the newly proclaimed reserves was Langberg, which stretched from Olifantshoek in the west to Lylyveld in the east, from Alister in the north to Mamaghodi in the south (Snyman, 1986). The area presently known as the farm Jenkins, fell within the south-eastern end of the newly proclaimed Langberg Reserve. The establishment of so many "native reserves" in close proximity to the study area clearly support the suggestion made earlier that the study area was centrally located in the historic and prehistoric territories of Tswana groups such as the Thlaro and Thlaping. In the same year a trader by the name of John Ryan established a shop on the farm Bishop's Wood. This farm is located 19.4 km to the north-west.

16 November 1895	The Crown Colony of British Bechuanaland was annexed by the Cape Colony (www.wikipedia.org).
September 1896	During this time a viral disease affecting cattle (and some other species of even-toed ungulates) known as Rinderpest swept through Southern Africa (www.wikipedia.org). Although attempts were made to halt the spread of the disease from the north (by erecting a fence between the boundaries of Griqualand West and Bechuanaland), these measures proved unsuccessful. Incidentally, only three gates were placed in this fence, namely at Gatlhose, Nelsonsfontein and Blikfontein (Snyman, 1988). Of these three places, Gatlhose is the closest and is situated 8 km east of the study area.

Figure 21 - An everyday scene in Griqualand West during the Rinderpest Epidemic: large numbers of destroyed cattle (Snyman, 1983:20).

1897	The Rinderpest epidemic did not only have a massive socio-economic impact on the landscape, it also resulted in the Langberg Rebellion of 1897. During this time conflict broke out between the authorities and a Thlaping leader from Taung, namely Galeshiwe. The conflict arose after infected cattle belonging to him were destroyed by representatives of the government as a way of curbing the spread of the disease. After killing an officer, Galishewe fled to the Thlaro leader Toto of the Langberg. Subsequently, a full-scale rebellion broke out (Breutz, 1963). The British authorities eventually mustered a military force which included sections of the Cape Mounted Rifles and Bechuanaland Field Force, amounting a force of roughly 1,000 men by 14 March 1897. Opposing this formidable and well equipped force supported by artillery, the Tswana "rebels" fielded a force of roughly 1,500 men. However, from the outset of hostilities the "rebel" force was hampered by serious shortages in the way of provisions and ammunitions (Snyman, 1986).

	Although most of the activities associated with the rebellion took place some distance to the west of the study area, the impact of the rebellion was felt throughout the surrounding landscape. Some noteworthy skirmishes took place on 9 May 1897 at Puduhush and on 30 July 1897 at Gamaluse and Gamasep. Furthermore, the main British force under the overall command of Lieutenant-Colonel E.H. Dalgety used the farm Bishop's Wood as a base of operations (Snyman, 1986). The farm Bishop's Wood is located 19.4 km north-west of the study area. This said, the closest events of 1897 to the study area appears to have taken place on 14 June 1897, when the British Commanding Officer ordered "…*Captain Pringle with No. 13 Mounted Rifle Club to occupy Mokanen*." (Dalgety, 1898). The farm Mokaneng is located immediately east of Jenkins. The rebellion was suppressed and came to an end with the surrender of rebel leader Toto, his son Robanyane and their Thlaro followers on 2 August 1897 (Snyman, 1986).

Figure 22 Toto, leader of the Thlaro along the Langberg (Snyman, 1986:17).

30 September 1897	One of the significant consequences of the Langberg Rebellion was the promulgation of The Bechuanaland Native Reserves Act (17 of 1897). This act facilitated the confiscation of land owned by the vanquished rebels of the Langberg. Proclamation 419 of 30 September 1897 declared the following reserves as Crown Land: Deben (5,115 hectares), Kathu (19,537 hectares) and significantly for the present study area, Langberg (178,406 hectares). This means that the area currently known as the farm Jenkins would have been declared Crown Land on this day (Snyman, 1986). While this event would have directly led to the creation of the farm Jenkins, the confiscation of these reserves would have had significant socio-economic implications for the people of the Langberg. Only two sections of the Langberg Reserve were not confiscated, namely Olifantshoek and Gappepin (11,140 hectares). These two areas were owned by leaders loyal to the Crown, namely Khibi and Magakwe (Snyman, 1986). The farm Gappepin Reserve, immediately to the south of Jenkins, represents the area that was owned by Magakwe. Incidentally, the residents of Olifantshoek and Gappepin were later persuaded to relocate to Gamopedi, to the west of Kuruman (Snyman, 1986).
November 1897	In November 1897 a total of 72 farms were surveyed in the old Langberg Reserve. The survey work was carried out by land surveyor J.C. Wessels and his assistant, D. Roos. Wessels had taken part in the Langberg Rebellion as a volunteer officer, and he provided many of the farms from this area with names of people and places closely associated with the events of the rebellion (Snyman, 1986). These include the farms Dalgetty, Toto, Luka and Puduhush. The farm Jenkins would also have been surveyed by Wessels and Roos in November 1897. Although the identity of the person who gave the farm its name could not be irrevocably established, at least three persons with this surname appears to have taken part in the events relating to the rebellion. These three individuals are Lance-Corporal C.H. Jenkins (Cape Medical Staff), Private H.H. Jenkins (Cape Police) and Sergeant W.H. Jenkins (Cape Police) (www.angloboerwar.com).
1898 - 1906	From 1898 onward, the white settlement of the farms which had formed part of the Langberg Reserve, took place. The conditions required for the new landowners were that they had to be 21 years or older, had to occupy the land within six months and were not allowed to own any other land. The applicants had to pay a twentieth of the farm price over the course of five years, at which point the farms were registered in their names with the condition that further payments of twentieths of the farm price be made on an annual basis for the subsequent 15 years. The prices of the farms ranged between £125 and £315. Many of the farms from within the Langberg Reserve were transferred to their new owners between 1904 and 1906 (Snyman, 1986). The history of the farm Jenkins was no different. On 29 October 1904, the farm was transferred to H.J. Delport. It seems evident that Delport had completed the payment of five annual payments as outlined above and the farm was registered in his name.

1899 - 1902	The South African War was fought between Great Britain and the Boer republics of the Zuid-Afrikaansche Republiek and Orange Free State. However, no skirmishes or battles from this war are known from the direct vicinity of the study area. The closest known battles and skirmishes to the present study area include Kareepan on 10 August 1901 and Doornfontein in February 1902 (Snyman, 1983). These farms are located roughly 54 km south and 52 km south-east of the study area respectively. The war ended on 31 May 1902 with the British as victors. The effects of the war were felt for years after the hostilities had actually ended.
1905	In this year the farm Jenkins was transferred from H.J. Delport to P.M. de Kock (KAB, T, 931, 4029).
1907	A number of trekboers from the southern Free State arrived in the general vicinity of the study area (Erasmus, 2004).
1913	In this year the so-called "Native Locations" of Skeyfontein and Groenwater were established by Proclamation 131 of 1913 (Breutz, 1963).
1914	The town of Dibeng was laid out in 1914 on the banks of the Ga-Mogara River. This followed on the establishment of the Dibeng Dutch Reformed Church parish in 1909 (Erasmus, 2004). As indicated before, Dibeng (Deben) is located 34.6 km north-west of the present study area.
1914 - 1915	In 1914 the South African government under General Louis Botha decided to assist Great Britain in its war with Germany. A number of Boer leaders were not happy about this turn of events, and when General Koos de la Rey was killed at a roadblock in Johannesburg emotions reached a boiling point and rebellion broke out across what was then known as the Transvaal, Free State and northern regions of the Cape Province. In terms of the present study area, it was especially the events surrounding the trek of General Jan Christoffel Greyling Kemp which is significant. As one of the foremost leaders of the rebellion, Kemp decided that the best strategy for continuing the rebellion was to use the German colony of South West Africa (present day Namibia) as a base of operations to carry out attacks on South Africa and its government from there. While the exact route followed by Kemp and his commando of 610 men on the way to present-day Namibia is not known, his journey through the general surroundings of the study area can be traced from his memoirs. Due to the severe environmental conditions, Kemp's column travelled primarily by night, which allowed them to rest during the heat of the day. General Kemp and his commando departed from Kuruman on the afternoon of 9 November 1914, arriving at Vlermuisvlakte on the morning of 10 November 1914. They continued their journey that afternoon, halting at Ruts that same evening. The following day, Kemp and his men moved to Gamagara, where they rested until the following afternoon. On 12 November 1914, they travelled from Gamagara to Dikeping, arriving at this farm on 13 November 1914.

	While *en route* to Dikeping, Kemp instructed a small group of rebel scouts under Captain Williams to proceed ahead and *reconnoitre* the road to Postmasburg. While carrying out this order, the scouts were attacked by Government commando. One of the rebel scouts, Cornelis Coertze, was killed in the fight. While the exact position of the skirmish is not known, it would have been between Gamagara and Dikeping, and quite likely reasonably close to the latter place. This can be surmised from the fact that Coetzer was buried by Kemp's men on the farm Dikeping. On the afternoon of 13 November 1914, Kemp and his men departed from Dikeping, and arrived at Mount Temple in the Langeberg Mountains the following morning. While "Vlermuisvlakte" could not be found, a place by the name of Vlermuisleegte is located between Kuruman and Kathu, at a point roughly 36.2 km north-east of the study area. It is evident that these two places must be the same. No information on "Ruts" could be found, however Gamagara is the name of a farm on the Ga-Mogara River and is located 6.9 km north of the study area. Finally, the farm Dikeping, where Cornelis Coertze was buried on 13 November 1914, is located 9.3 km south-west of the study area.
 *Figure 23 General Jan Christoffel Greyling Kemp (Wulfsohn, 1992).*	
12 February 1919	A portion of the farm Jenkins was transferred to J.J de Kock. This portion, which represents a significant section of the present study area, was at the time renamed Mooihoek (Chief Surveyor-General of South Africa).

1922	In this year T.L.H. Shone discovered manganese on the farm Doornfontein. Although the presence of manganese in the surrounding landscape had been known before this discovery, Shone was the first person to actually mine manganese in this area and was also responsible for focussing the attention of those interested in manganese on the surroundings of Postmasburg (Snyman, 1983). The farm Doornfontein 446 is located approximately 27.5 km south-west of the study area.

Figure 24 Captain T.L.H. Shone (S.A. Manganese, 1977:24)

1925	With partners Reg Saner and John Dale-Lace, T.L.H. Shone established the first manganese mining company in South Africa, namely Union Manganese Mines and Minerals Limited. The company obtained options on a number of farms in the Postmasburg district (Snyman, 1983).

1925 - 1926	In an attempt to create awareness about the newly discovered manganese fields as well as his company, Shone approached the government for assistance. They responded by sending the Assistant Director of the Geological Survey, Dr A.L. Hall, to carry out an intensive geological survey of the newly discovered manganese deposits in proximity to Postmasburg. Dr Hall commenced with his work in December 1925 and found small prospecting workings all along the range of hills known as the Gamagara Hills, and especially so on a number of farms north of Postmasburg. These included Gloucester (13.8 km south-east of the study area), Paling (22 km south of the study area), Doornfontein (27.5 km south-west of the study area) and Magoloring (18.4 km south of the study area). The prospecting workings observed by Hall were primarily the result of the prospecting activities carried out by Shone and his partners during the early 1920s. Dr Hall's report published in 1926 provided a very favourable view of the manganese fields and indicated that the "…Postmasburg area holds deposits of manganese ore in large quantities comparable to the scale on which well established sources in other parts of the world are exploited." (Cairncross et al., 1997: 16). The only concern raised by Dr Hall in his report was the lack of suitable transport methods such as a railway linking the manganese deposits with the markets and coastal harbours. His report recommends as follows: "*It is in any rate certain that with large tonnages of high-grade ore available, the extension of railway facilities to Postmasburg would go a long way towards the establishment of an important South African manganese industry*" (Cairncross et al., 1997:17).
1927	Gamagara Manganese Corporation Ltd and Central Manganese Ltd obtained options on farms in the vicinity of Lomoteng and Sishen (Snyman, 1988).
4 November 1930	On this day the extension of the railway line from Koopmansfontein to Postmasburg was officially opened by the Minister of Railways, C.W. Malan. This meant that Postmasburg was now one of the few towns in the Northern Cape which boasted a direct rail link. While the extension of the railway line to Beeshoek was built by the Manganese Corporation further extensions to Lohatla and Manganore (1936), Sishen (1953) and Hotazel (1961) were undertaken by the South African Railways (Snyman, 1983).
1930 - 1932	During 1930 an Englishman by the name of Pringle-Smith was appointed by S.A. Manganese to devise and execute a "...*thorough prospecting programme of S.A. Manganese's properties*..." (S.A. Manganese, 1977:46). This followed on the earlier prospecting work and which had been halted due to the poor financial climate and the lack of a railway link. Within a short spate of time, Pringle-Smith started opening up the beds on the farms Kapstewel (21.5 km south-east of the study area) and Doornput. However, the company did not have the market which, for example, the Manganese Corporation possessed at the time, and as a result the ore was stockpiled at these two farms. Pringle-Smith left the Postmasburg area in 1932 after the financial implications of the Great Depression worsened the situation for S.A. Manganese to such an extent that he was asked to agree to a much lower salary (S.A. Manganese, 1977).

Early 1930s	Due to the financial impacts of the Great Depression, a number of smaller manganese mining companies were closed down. A period of amalgamation followed which resulted in the South African Manganese Limited as well as the Associated Manganese Miners of South Africa Limited becoming the leaders in the manganese mining industry (Snyman, 1983).
c. 1932 - 1937	During this approximate period, a geological assessment of the minerals and ore deposits of the Postmasburg District was undertaken by the South African Geological Survey. Dr Leslie Gray Boardman was one of the members of the geological team. His responsibility was to work on manganese and haematite deposits in the district. Apart from the manganese deposits near Postmasburg, Dr Boardman also identified large deposits of iron ore deposits on farms to the north-east of the study area, including Sishen, Bruce and King (S.A. Manganese, 1977). The first two farms are located 7.4 km and 7.9km north of the study area, with the farm King located immediately to the north of Jenkins.

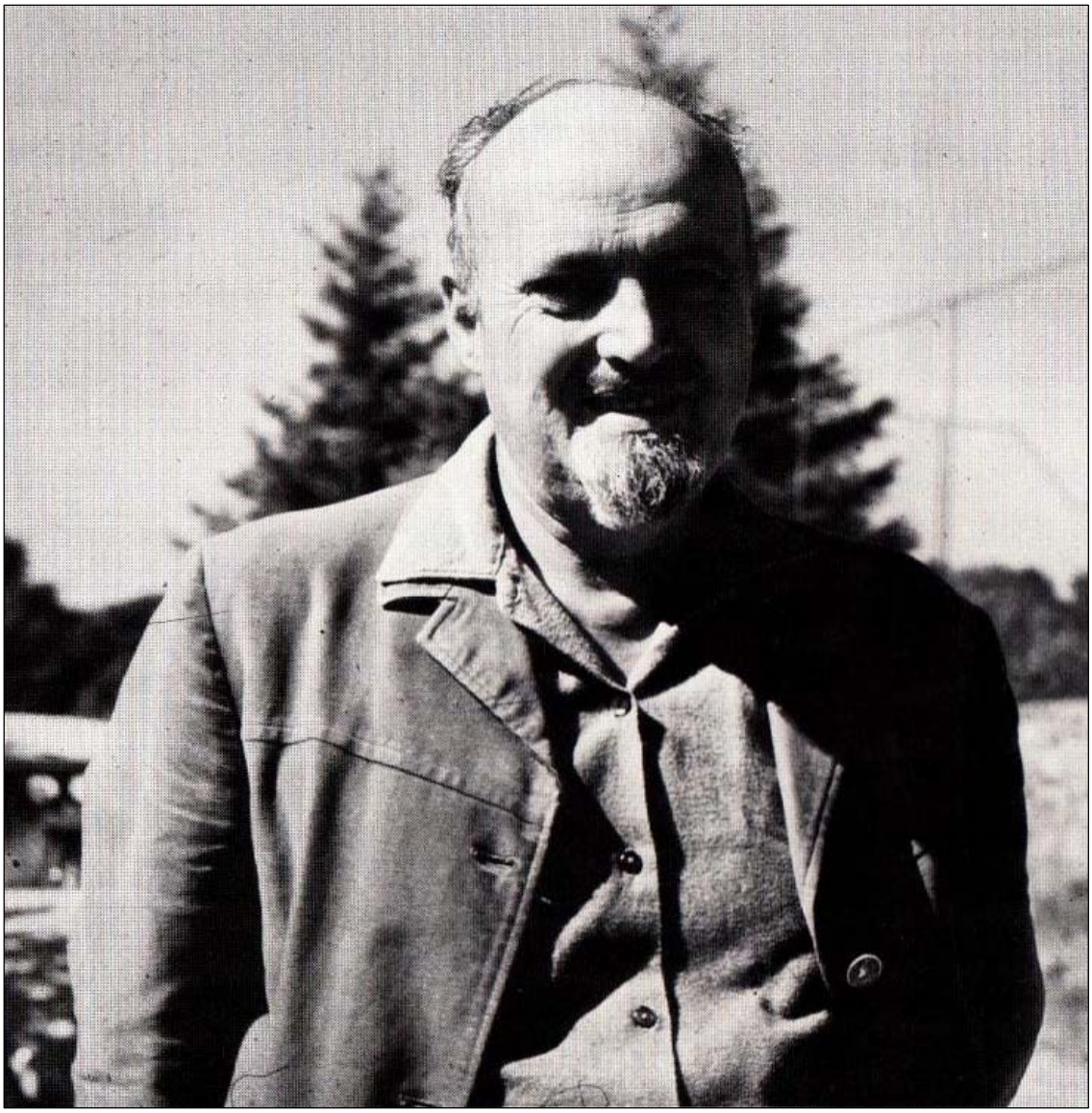


Figure 25 - Gr. Leslie Gray Boardman, the geologist who during the 1930s realized the immense potential of the Sishen area for iron ore mining (S.A. Manganese, 1977:65).

c. 1936	After the South African Railways Administration expressed their willingness to extend the railway line from Postmasburg to Kapstewel and Lohatla, the entire manganese industry north of Postmasburg changed for the better. An example of this was that S.A. Manganese stepped up operations on the farm Kapstewel. The work here was overseen by none other than Captain T.L.H. Shone (S.A. Manganese, 1977). The promise of railway extensions to this area also resulted in other mining activities such as the establishment of a mining company by the name of Gloucester Manganese. This company was established to mine the manganese deposits on the farm Gloucester (located 13.8 km south-east of the study area). Shortly thereafter an amalgamation took place between Gloucester Manganese and the Manganese Corporation which resulted in the formation of the Associated Manganese Mines of South Africa Limited (Ammosal). Ammosal re-erected the old ore handling plant from Beeshoek on the farm Gloucester and the operations here represented a large portion of the total manganese production of 250,000 tons (S.A. Manganese, 1977).

Figure 26 Prospecting activities on Kapstewel during 1937 (S.A. Manganese, 1977:59).

1937	The farm to the east of Gloucester, named Lohatla, was now being viewed more favourably by S.A. Manganese. During this year they reached an agreement with the owner, which eventually resulted in the acquisition of the farm (S.A. Manganese, 1977). During the same year the company bought the freehold of the farm Klipfontein and also bought 600 morgen of the farm Kapstewel in order to build a staff village. This village was named Manganore (S.A. Manganese, 1977). The Lohatla mine village was also established during this time (Snyman, 1983). Furthermore, African Metals Corporation Limited (Amcor) was established "…*to manufacture semi-processed iron and steel products*…" and in 1937 obtained the farm Demaneng for this purpose. However, this venture was a failure (Snyman, 1988:84).

Late 1940s	During this time the decision was made by two of the bigger role players in the manganese mining industry around Postmasburg for the mining of haematite iron ore to commence in earnest. S.A. Manganese in conjunction with the African Metals Corporation (Amcor) established a new company known as Manganore Iron Mining Ltd to work on the iron ore deposits owned by them. These deposits were *inter alia* located on the farms Klipfontein, Kapstewel and Doornput (S.A. Manganese, 1977). Similarly, Associated Manganese Miners of South Africa became very active on the farm Beeshoek (Snyman, 1983).
c. 1950	At the time Dr L.G. Boardman was assessing the ore reserves at Manganore and Lohathla as well as the farm Lilyveld for S.A. Manganese. He found that the latter farm contained large quantities of haematite iron ore and persuaded the directors of S.A. Manganese to acquire the farm (S.A. Manganese, 1977). The farm Lilyveld is situated 7.3 km north-east of the study area.
1953	Iscor commenced iron production at Sishen (Snyman, 1983). In the same year, the railway line from Postmasburg to Sishen was extended to haul ore to Iscor's plants in Pretoria, Vanderbijlpark and Newcastle (Erasmus, 2004).
1958	At least by 1958, Manganore Iron Mining also owned mineral and surface rights on the farm Sekgame which occurs about 14.9 km north-east of the study area.
1958 - 1978	Iron ore (and manganese) mining activities were undertaken by Consolidated African Mines on the farms Pensfontein, Kapstewel and Rooinekke. These activities were halted when the market for iron disappeared in 1978 (Snyman, 1983).
1959 - 1966	Iron ore mining activities were started at the so-called Springbok Mine during 1959. These activities took place around a low hill situated south-west of Postmasburg. The work on the town end of the property was undertaken by the Springbok Industrial and Mineral Ventures Limited and the work undertaken on the other end (toward the farm Koeispeen 475) were undertaken by Griqualand Iron Ore (Pty) Ltd. The mining activities of the companies at Springbok Mine ceased in 1966 (Snyman, 1983). The Springbok Mine is situated 41 km south of the study area.
Early 1960s	The residents of Skeyfontein and Groenwater were forcibly removed from their land as part of the system of Apartheid (BAO, 2390, D188/1235/1).
1963	F.M. Mangan discovered iron ore deposits on the farm Kareepan (Snyman, 1983). The farm Kareepan is located 30.3 km south-east of the study area.
c. 1966 - 1978	During this time Springbok Industrial started mining the iron ore deposits which had been discovered on Kareepan in 1963. By 1978 all activities were halted as there was no more market for iron ore (Snyman, 1973).

1973	In this year a second mine was opened at Sishen to supply export iron ore to Saldanha Bay. During the same year the town of Kathu was established to accommodate employees for the new mine (Erasmus, 2004). Kathu is located 22.7 km north-east of the study area.
1976 - 1977	During this time the Gatlhose and Maremane Communities were removed from their land and taken to the Shipton Farms in the then homeland of Bophutatswana. After their removal, the South African Government decided to establish a Battle School here. As the Khosis Community was still staying on the land, they were moved to a section of the original land roughly 14 000 hectares in extent. The Lohatla Battle School was subsequently established (www.lrc.org.za/Docs/Judgments/khosis.doc).
1977	During this year the 860 km long Sishen-Saldanha railway line was completed (Erasmus, 2004).
1980	In 1980 the town of Kathu received municipal status (Erasmus, 2004).

7.2 Findings from Historic Overview

Although the historic overview of the study area and surroundings has revealed a long and significant history for this area, very few of the historical events highlighted in this report can be positively linked to the study area itself. This said, in a number of cases, mention is made to properties and localities located adjacent or very close to the study area. Furthermore, as the farm Jenkins was only surveyed in 1897, the study area would have formed part of the prehistoric and historic settlement and migration of people without any reference to this farm.

The following events from the historic overview can be linked to the farm Jenkins itself:

- In 1886 the farm formed part of the newly established “Langberg Native Reserve”.
- After the events of the 1897 rebellion, the Langberg Reserve was confiscated by the British Authorities.
- The farm Jenkins would have been surveyed by land surveyor J.C. Wessels and his assistant D. Roos in November 1897.
- During the late nineteenth century the farm Jenkins was occupied by H.J. Delport.
- H.J. Delport transferred the farm to P.M. de Kock in 1905.

- A portion of the farm known as Mooihoek was transferred from P.M. de Kock to J.J. de Kock on 12 February 1919. This portion represents a significant section of the present study area.

Apart from these aspects, the historic study also highlighted some of the historical and archaeological sites which might potentially be located within the study area. These include Stone Age sites, Iron Age sites associated with the histories of the Thlaro and Thlaping (likely in the form of old homesteads with or without stone walling), sites associated with the Kora and Griqua periods (graves, buildings and middens), sites associated with the early and later settlement of white farmers in the area (graves, farmsteads and middens) as well as mining-related sites (shafts, trenches and discard dumps as well as abandoned mine machinery and mine buildings).

8 PALAEONTOLOGICAL OVERVIEW AND FINDINGS

PGS Heritage commissioned Dr Gideon Groenewald to compile a palaeontological desktop study for the proposed development. Refer Annexure A for the complete report.

8.1 Geology of the Study Area

The study area is underlain by Vaalian aged Gamagara and Ongeluk Formations of the Olifantshoek Group, Griqualand West Supergroup and Tertiary aged surface limestone or calcretes.

8.1.1 Griqualand West Supergroup

8.1.1.1 Olifantshoek Group

Predominantly continental “red beds” (fluvial sediments), subordinate shallow marine siliciclastic metasediments (low grade), lavas and carbonates (Johnson et al 2009).

Gamagara Formation

The Vaalian aged Gamagara Formation consists primarily of Quartzite, conglomerate, flagstone and shale, with manganese enriched layers of conglomerate and shale.

Ongeluk Formation

The Vaalian aged Ongeluk Formation consists primarily of volcanic rocks.

8.1.2 Calcrete

The Tertiary aged surface limestone and calcrete underlies the lower lying areas in the western part of the study area.

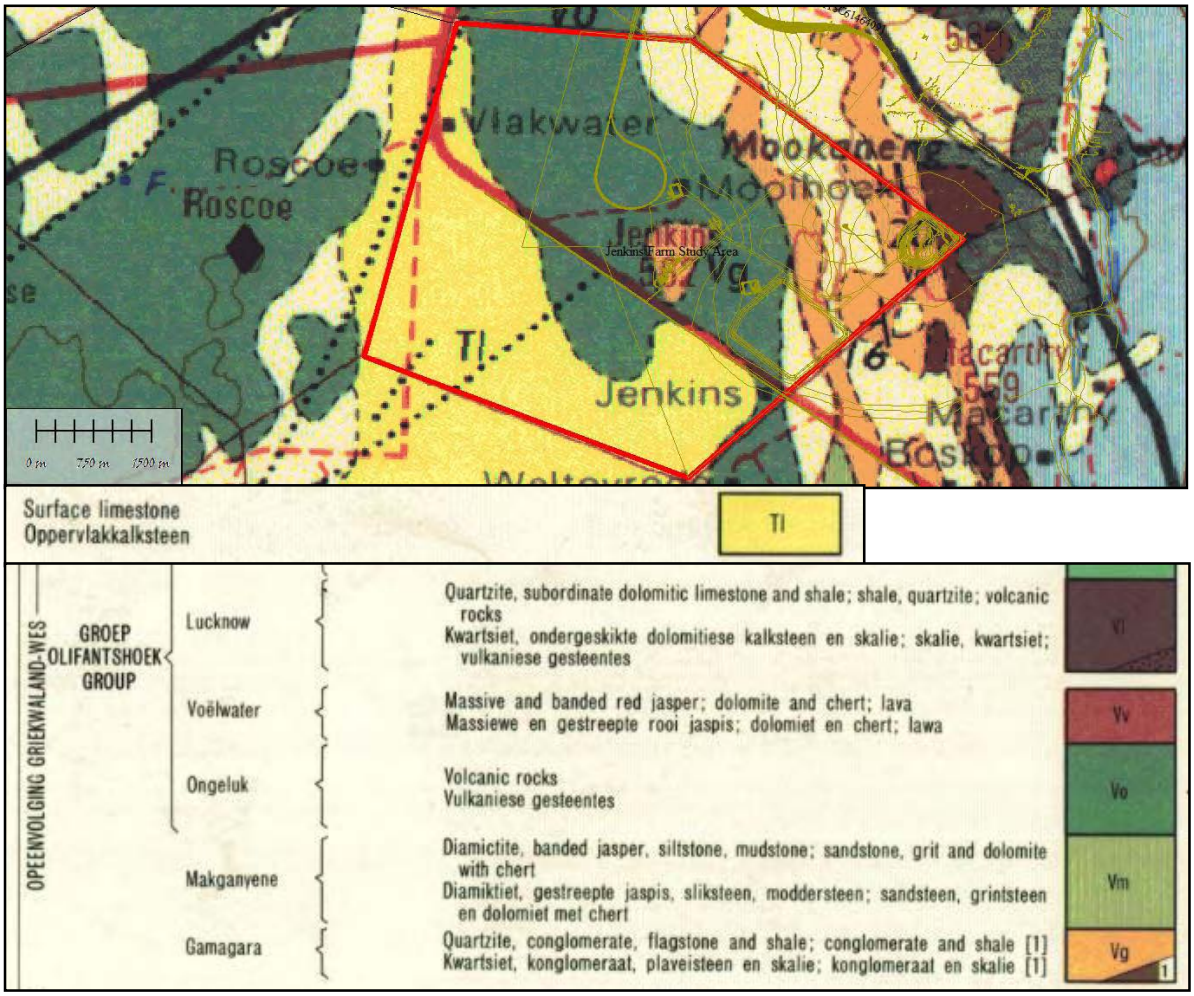


Figure 27 – Map showing the geology of the study area

8.2 Palaeontology of the Study Area

8.2.1 Griqualand West Supergroup

8.2.1.1 Olifantshoek Group

Possible stromatolites and microfossils in marine units of the sequence. Continental "red beds" record development of early oxygen-rich atmosphere (MacRae, 1999).

Gamagara Formation

Laterites suggest possible earliest biological activity on land. Stromatolites might be associated with some of the dolomitic layers. Although very significant for the understanding of these palaeo-environments the fossils are of microscopic size and not visible to the naked eye. If recorded in any detailed studies of the ore body, the presence of the fossils must be reported to SAHRA as part of the recording of our National Palaeontological Heritage.

8.2.2 Calcrete

A wide range of fossils can be present in these surface deposits, including mammalian bones and teeth, tortoise remains and ostrich egg shells. The mining activity might uncover some calcrete beds and the recording of fossils will be significant.

8.3 Palaeontological Sensitivity of the Study Area

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 of the main report.

The Vaalian aged Gamagara and Ongeluk Formations are allocated a Moderate Palaeontological sensitivity and the recording of micro-fossils during detailed analyses of ore samples must be reported to SAHRA. This requirement however does not fall within the scope of the EMP of the project and is of academic interest only. A High sensitivity rating for Palaeontological Heritage is allocated to the area of the farm underlain by surface limestone. Mining activity in this area is however restricted to surface infrastructure and no significant fossil finds are expected.

8.4 Palaeontological Findings

The farm Jenkins 562 is mainly underlain by Vaalian aged rocks of the Gamagara and Ongeluk Formations, Olifantshoek Group, Griqualand West Supergroup and Tertiary aged Calcretes and surface deposits. Although significant fossils are associated with the Vaalian aged rocks of these geological units, the fossils are not visible to the naked eye and is of academic interest. Significant larger scale fossils are associated with surface calcretes, but these units fall outside the the proposed development area. The following recommendations are made by Dr Gideon Groenewald:

1. The EAP as well as the ECO for this project must be made aware of the fact that sediments of the Gamagara and Ongeluk Formations, Olifanthoek Group, contain significant fossil remains, albeit mostly stromatolite structures and micro-fossils. The calcrete deposits can contain significant remains of Tertiary aged animals.
2. A High Palaeontological sensitivity is allocated to surface limestones and a Moderate Sensitivity to the rest of the area. If any fossils, most notably stromoatolite structures, are recorded during investigations of the ore bodies the ECO must be notified and a qualified palaeontologist must be appointed to report these finds to SAHRA by conducting of a Phase 1 PIA investigation.
3. No further mitigation for Palaeontological Heritage is recommended for this development.

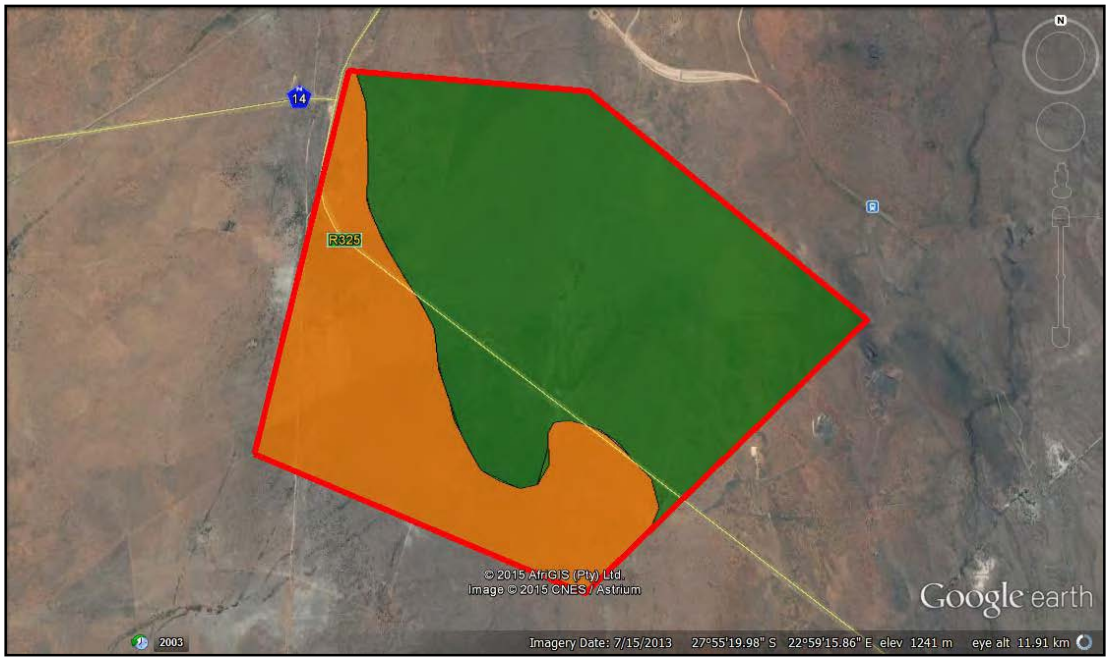


Figure 28 – Palaeontological sensitivity of the farm Jenkins is moderate to highly significant. All the active mining footprints fall within the zone of Moderate Palaeontological sensitivity

9 FIELDWORK FINDINGS

9.1 Introduction

The fieldwork comprised a systematic walkthrough of all development footprint areas proposed for the Remainder and Portion 1 of the farm Jenkins 562 by a fieldwork team comprising an archaeologist (Polke Birkholtz) and field assistant (Heidi James-Birkholtz). The archaeologist was equipped with a hand-held GPS, and his recorded track logs are depicted in white below.

The fieldwork was carried out from Wednesday, 22 July 2015 to Friday, 24 July 2015 as well as from Monday, 27 July 2015 to Tuesday, 28 July 2015.

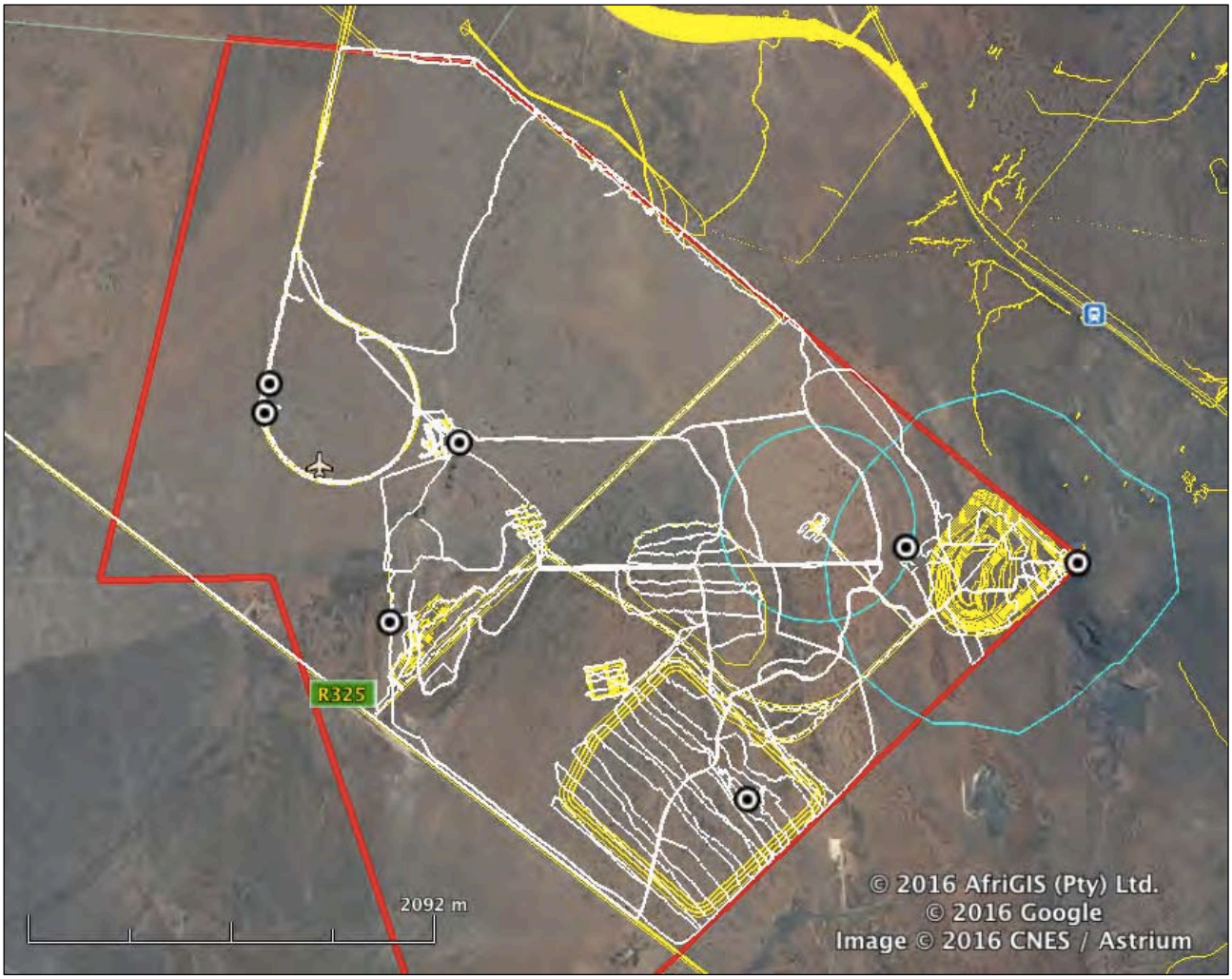


Figure 29 – The track logs recorded during the fieldwork of July 2015. The red line demarcates the boundaries of the Remainder and Portion 1 of the farm Jenkins, the yellow lines the footprint areas and the blue lines the buffer areas around the explosive magazine and pit. The identified sites are also shown. It is clear from this depiction that all footprint areas from within the property were thoroughly covered on foot.

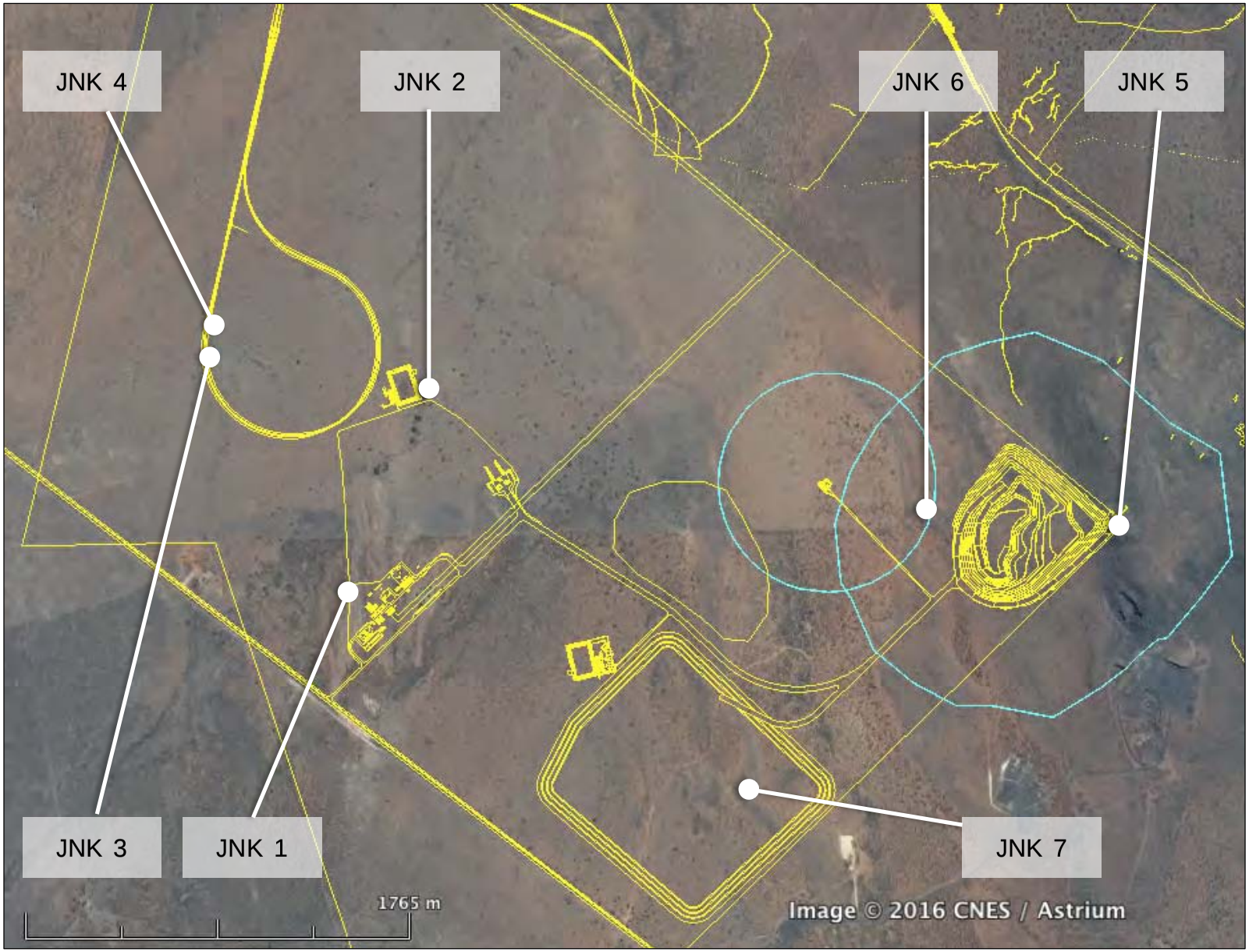


Figure 30 – Overlay map of the distribution of identified sites over the proposed mining footprint areas. The yellow lines depict footprint areas with blue lines representing projected buffer areas around the explosive magazine and pit.

9.2 Fieldwork Findings

A total of seven heritage sites were identified during the fieldwork conducted by PGS Heritage in 2015. The table below provides an overview of all these identified heritage sites.

Site	Latitude	Longitude	Description	Significance
JNK 1	27° 55' 25.9S	22° 59' 13.7"E	Surface scatter of MSA and LSA lithics	Medium
JNK 2	27° 54' 56.0"S	22° 59' 26.7"E	Historic farmstead older than 60yrs and an associated low density midden	Medium
JNK 3	27° 54' 51.1"S	22° 58' 50.0"E	MSA/LSA lithics around a pan	Medium
JNK 4	27° 54' 46.2"S	22° 58' 50.0"E	Rectangular stone structure, possible grave	Medium - High
JNK 5	27° 55' 15.8"S	23° 01' 23.1"E	Low density surface scatter of MSA lithics	Medium
JNK 6	27° 55' 13.4"S	23° 00' 51.0"E	Rock shelter with Rock Art and low density surface scatter LSA lithics	High
JNK 7	27° 55' 55.3"S	23° 00' 21.1"E	Five crescent-shaped stone structures, possibly associated with the events of 1897.	Medium - High

An overlay of these seven heritage sites was made over the available mining development layout plan. Please note that with the exception of the rock art site (JNK 6), all the identified sites are located within the proposed development footprints and will be directly impacted upon by the proposed mining development.

A HIA does not require the input of a specialist (SAHRA Minimum Standards 2007). Nonetheless, in view of the nature of the archaeology and heritage of the Postmasburg region and also the sensitivity of the nearby Kathu archaeological sites, PGS Heritage requested that a Stone Age specialist conducts a review of the sites and localities with Stone Age remains that have been documented in the study area. Dr. Maria van der Ryst's assessment of each site as well as her recommendations are integrated in this report.

In view of the general Stone Age archaeology of the study area and surroundings, Dr. Maria van der Ryst indicates that "…*where Stone Age occurrences have been documented these are usually distributed either in fairly low scatters over large areas, or in very high densities where*

sources of Cryptocrystalline Silicas (CCS) are available as outcrops or at near extant and fossil water sources and also where Banded Ironstone Formations (BIFs) outcrop."

In terms of the Stone Age archaeology from within the study area, Dr. Maria van der Ryst states that *"…the Jenkins collection is not large enough for the MSA tools to be assigned to particularly phases within the MSA. The range of tool types, the diversity of raw materials used as well as the presence of formal tools types reflect various instances of site utilization over a very long period of time."*

9.2.1 JNK 1

Site Coordinates:

S 27° 55' 25.9"
E 22° 59' 13.7"

Site Description:

The site is located around a conspicuous outcrop of oxidised quartzites that abuts an area of red Hutton sands and is located at the western base of a prominent quartzite ridge.

Middle Stone Age and Later Stone Age lithics were identified, of which several are very good examples. MSA lithics from the site include a core with blade removals, a well-made large scraper and convergent flakes with utilization. Later Stone Age tool types comprise a small quartz crystal LSA blade and several flakes. The tools are manufactured from a variety of CCS materials and quartzite. It is possible that further investigations may expose underlying archaeological material in the sandy soils characterising the site.

The visible component of site extends over an area roughly 10m x 10m in extent.

Site Significance:

The site comprises very good examples of MSA/LSA lithics which appear in significant quantities for a relatively small area. As a result, the site is of Medium Significance i.e. Generally Protected 4B (GP.4B).

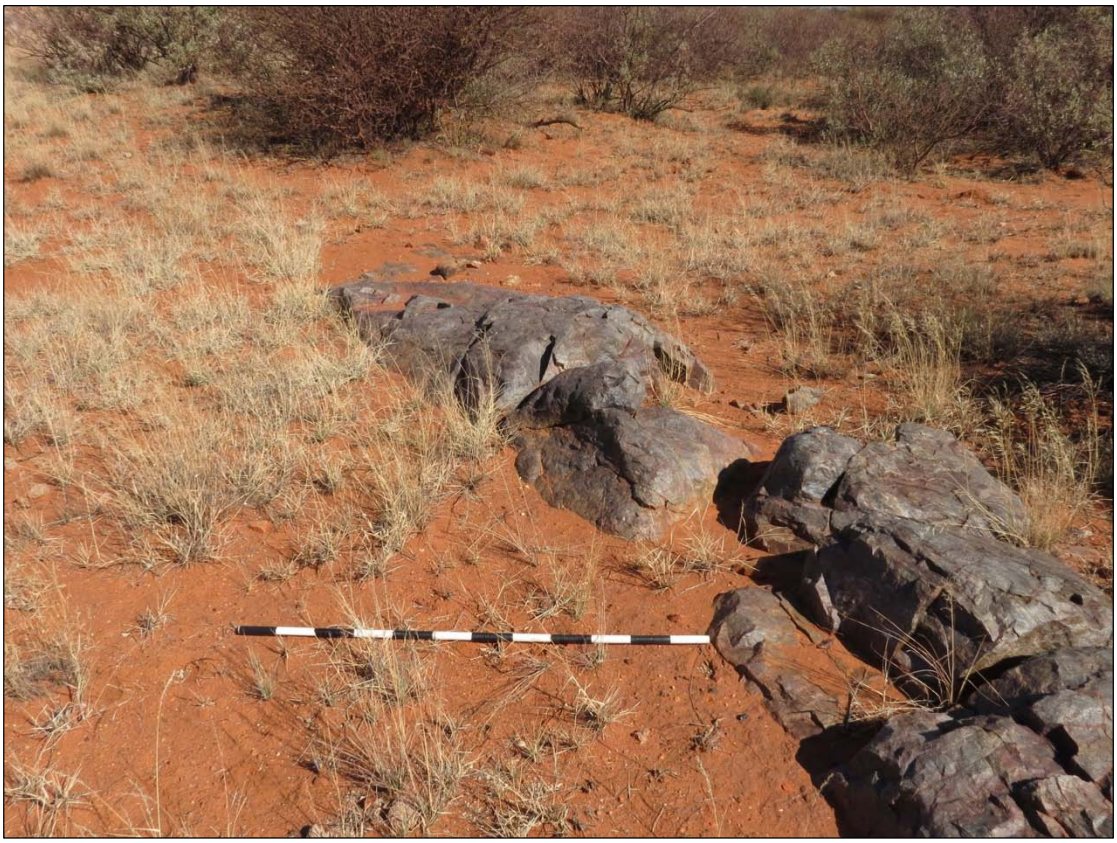


Figure 31 – General view of site JNK 1. Scale is in 10 cm increments.

Figure 32 – A number of MSA/LSA lithics from site JNK 1. Scale is in 1 cm increments.

9.2.2 JNK 2

Site Coordinates:

S 27° 54' 56.0"
E 22° 59' 26.7"

Site Description:

A historic farmstead is located here and comprises a farmhouse, associated structures and outbuildings as well as a midden.

The farmhouse is east facing and in a poor condition. It has wooden doors and window frames and exhibit decorative coining around its northern and eastern entrance doors. The house was constructed using mud bricks and has a stone foundation. The wooden beams used for the roof structure are cylindrical poles and the roof is corrugated iron. The roof is pitched on certain portions of the house and sloped on others. A low wall encloses the main veranda on the eastern end of the building and a walkway leads to two steps and the veranda. A second, smaller veranda is located at the northern entrance, and leads into the kitchen. The kitchen has a large built-in oven, with a chimney still evident.

The house has two verandas and eight rooms, including a *stoepkamer* (enclosed veranda room) on its north-eastern corner, a large centrally located kitchen, a living room and six unidentified rooms which would also have included bedrooms. A passage leads from the front door (which is located on the large veranda on the eastern end of the house) past two other rooms into the large kitchen, from which four other rooms could be accessed. The kitchen also leads onto a second, smaller veranda by way of a backdoor.

The homestead has an outside toilet, which also exhibits decorative coining. A small rectangular stone enclosure with annex is located immediately to the north of the dwelling and a furrow-like structure was identified on the eastern side of the house. A steel cattle kraal with crush is located 55 m south-west of the farmhouse. Other features associated with the farmstead include a relatively modern corrugated iron shed structure roughly 78 m west of the farmhouse, as well as a windmill and cement dam located a short distance south of the iron shed structure. Furthermore, the rusted remains of an old truck can still be seen to the south of the farmhouse. The words “VERVOER KONTRAKTEUR” (i.e. transport contractor) can

still be read on the passenger door of the vehicle.

A low density scatter of cultural material which can be directly associated with the farmstead, was observed all around the house and surroundings. The midden materials cover a relatively extensive area and contain modern and historical glass, ceramics, a seashell fragment and other refuse. Stone tools were identified in low densities in amongst the cultural material that was associated with the farmhouse.

The site extends over an area roughly 150 m by 150 m.

The farmhouse is certainly older than 60 years. However, apart from the structures in the immediate vicinity of the dwelling as well as the truck, none of the other features from the overall farmstead appears to be all that old. The historical research carried out for the purposes of this study revealed that the farm Jenkins was surveyed in November 1897. However, the subdivision of the portion of the farm known as Mooihoek (and where the farmstead is located) only took place on 12 February 1919. On this day, the portion known as Mooihoek was transferred from P.M. de Kock to J.J. Kock.

With the original farmstead on Jenkins in all likelihood located on the south-western end of the farm (where a well is known to have been located), it seems highly probable for the farmhouse to have been built by the new owner of the Mooihoek portion, namely J.J. de Kock. On the assumption that this premise holds true, the farmhouse would have been built after 1919. This suggested date appears to be supported by the tangible remains of the farmhouse as well as the cultural material identified in the midden.

The only concrete evidence for the age of the building is in the form of an inscription that was made in the wet cement of a small rectangular brick structure on the eastern end of the farmhouse. The inscription reads as follows: "*1 – 8 – 44 A.F.*" It is evident that the inscription refers to the year 1944.

Site Significance:

The farmhouse is certainly older than 60 years and represents a relatively unique example of early farmhouses from the surroundings of the study area. The site is deemed to be of Medium Significance i.e. Generally Protected B (GP.B).

Figure 33 – Eastern façade of the dwelling showing the veranda (left) and stoepkamer (right)

Figure 34- Sample of walling showing the mud bricks used to construct the homestead.

Figure 35 - Northern façade with small veranda and back door.

Figure 36 - The outside toilet with a section of the house visible in the back.

Figure 37 - The shed, windmill and concrete dam located to the west of the homestead.

Figure 38 - The rusted old truck on the southern end of the farm dwelling.

Figure 39 - Sample of glass fragments and cartridge observed on the surface of the site.

Figure 40 - Sample of stone tools observed on the surface of the site.

9.2.3 JNK 3

Site Coordinates:

S 27° 54' 51.1"
E 22° 58' 50.0"

Site Description:

Middle Stone Age and Later Stone Age lithics were identified all around a pan which is 980 m north-west of the farmhouse at JNK 2. The distribution pattern of the lithics shows an overall low level of stone tools and toolstone in association with several patches of higher lithic densities. The main raw materials used are jasper and other cryptocrystalline silicas (CCS), such as opalines and quartz. It is evident that resources found available in and on the periphery of the pan were utilized for the manufacture of lithics.

While the site extends all around the pan, the coordinates provided above represents one of the higher densities of lithics directly affected by the proposed railway line. The site in its entirety encompasses an area roughly 300 m by 200 m in extent.

Site Significance:

Hunter-gatherers view land as an integral part of their identity. Each group has a defined territory with a collection of natural resources on which they depend for survival (Marshall 1976; Barnard 2011). Ownership implies access to the resources of this area, an inalienable right which is acquired by non-exclusive inheritance and utilization. A main subsistence strategy in the planning of hunting and gathering trips is to limit the duration and the distances to be covered. Primary territories also included a permanent or semi-permanent waterhole (Smith 1999), such as the pans, springs and annual watercourses, along with other resources, in particularly plant foods. Investigations of pan localities suggest relatively short visits over time by small groups of people.

The site extends over a reasonably large portion of land and comprises low levels of lithics which are widely scattered. It is of Medium Significance i.e. Generally Protected 4B (GP.4B). In view of the proposed development, it is recommended that the pan site should be mitigated through sampling of lithics from areas of higher densities.

Figure 41– General view of the pan at Site JNK 3.

Figure 42 - Stone tools found at Site JNK 3. Scale is in 1 cm increments.

9.2.4 JNK 4

Site Coordinates:

S 27° 54' 46.2"
E 22° 58' 50.0"

Site Description:

A rectangular stone concentration orientated along the east-west axis was identified on the north-western end of the pan. The concentration has a large stone on its western end. These general characteristics of the stone concentration suggest that it might be a grave.

No cultural material could be observed on the structure, but evidence for the human occupation of the site could be seen from the immediate surroundings of the possible graves. These items include a broken horseshoe as well as a metal drum.

The site encompasses and area roughly 50 m by 50 m in extend.

Site Significance:

A worst case scenario must be accepted within which the stone concentration is viewed as a grave until such time that the presence of a grave here has been conclusively proven or disproven,

All graves have high levels of emotional, religious and in some cases historical significance. The site is deemed to be of Medium to High Significance i.e. Generally Protected 4A (GP.4A).

Figure 43 – Possible grave at site JNK4. Scale is in 10 cm increments.

Figure 44 – Cultural material observed in close proximity to the possible grave at site JNK 4.

9.2.5 JNK 5

Site Coordinates:

S 27° 55' 15.8"
E 23° 01' 23.1"

Site Description:

JNK 5 is a Stone Age site situated relatively high on a small hill on the far north-eastern corner of the farm Jenkins. The position of the site commands excellent views of the surrounding landscape.

The lithics are not in dense concentrations and are generally scattered. The lithics comprise mostly Middle Stone Age (MSA) tool types. A variety of CCS has been used in the production of the stone tools with an emphasis on jasper. Tool types that have been identified include some cores and formal tool types such as scrapers, awls, blades and also some utilized flakes. A biface was also observed.

The South African MSA is a broadly-defined time period of particular relevance with a research focus on the technology, cognition and social development of humans. The human groups that utilized the environment at Jenkins and who produced the MSA lithic sequence fall within the range of modern humans. The South African MSA archaeology, by being associated with the earliest known remains of anatomically modern people and also cultural modernity, represents a unique window on the physical, cultural and social developments within this time frame (Thackeray 1992; Deacon and Wurz 2001; Wadley 2001; Willoughby 2008).

Southern African MSA assemblages show great diversity resulting from factors such as the environment, resource availability and choices made in the selection of raw materials as well as technologies used in the production of artefacts. MSA assemblages also exhibit much variability in raw material usage and artefact morphology, with often low frequencies of formally-retouched artefact types. Within the long span of the MSA, older and younger assemblages are apparent. The earliest MSA assemblages date to around 250/200 000 years ago (ya), but are more widespread from the Last Interglacial (OIS 5) (Mitchell 2002:80). A biface observed at the site, may fall within the transitional period around 500 000 – 250 000

ya where the Large Cutting Tools (LCT's) (McNabb et al. 2004) were being replaced by smaller tool types that could be hafted onto a handle.

The Jenkins collection is not large enough for the MSA tools to be assigned to particularly phases within the MSA. The range of tool types, the diversity of raw materials used as well as the presence of formal tools types reflect various instances of site utilization over a very long period of time. During the MSA cores were prepared in order to produce pre-determined shaped blanks which were subsequently used to manufacture different tool types. The size of raw materials selected for a core influences the kind or reduction technology used (Andrefsky 2005:151-5). The prepared or Levallois core reduction technique requires relatively large objective pieces, and the method is not suitable for the generally small nodules of cryptocrystalline materials (CCS) that were preferred rock types during the LSA. Levallois reduction technology is based on the preparation of a core by systematic shaping to produce a conical or convex shape with a continuous striking platform around most of the perimeter of the selected nodule. Multiple flakes can be systematically removed from the prepared platform, with the conical objective piece maintaining its shape so that minimal re-preparation is required before subsequent removals (Andrefsky 2005:148-9).

Some of the flake and blade blanks at Jenkins exhibit faceted striking platforms derived from prepared cores as discussed above. The production of flake blanks in a size range of >30 mm was likely not only for expedient use, but also to fashion other formal tools, and in particular scrapers, awls, points and knives (Van der Ryst 2006). Several of the flake blanks have been utilized, demonstrating their use as expedient tools.

Lower down the hill some Later Stone Age (LSA) material was identified, including a quartz core.

As indicated above, the site is located on the eastern boundary of the farm Jenkins and in all likelihood extends to the neighboring properties as well.

The component of the site located within the study area extends over an area roughly 60m by 60m.

Site Significance:

Although the lithics are dispersed, the observed stone tools comprise a significant sample of formal tools. It is accordingly recommended that a collection of the lithics should be made. A small biface was also recorded. Similar small handaxes are considered to be an iconic tool type of transitional Earlier Stone Age (ESA) and MSA assemblages. The range of tool types, the diversity of raw materials as well as the presence of formal tools types reflect various instances of site utilization over a very long period of time. As the lithics were surface finds it is moreover likely that sub-surface assemblages may be present.

The site has some scientific and historical significance, and as a result is deemed to be of Medium Significance i.e. Generally Protected B (GP.B).

Figure 45 – General view of site JNK 5.

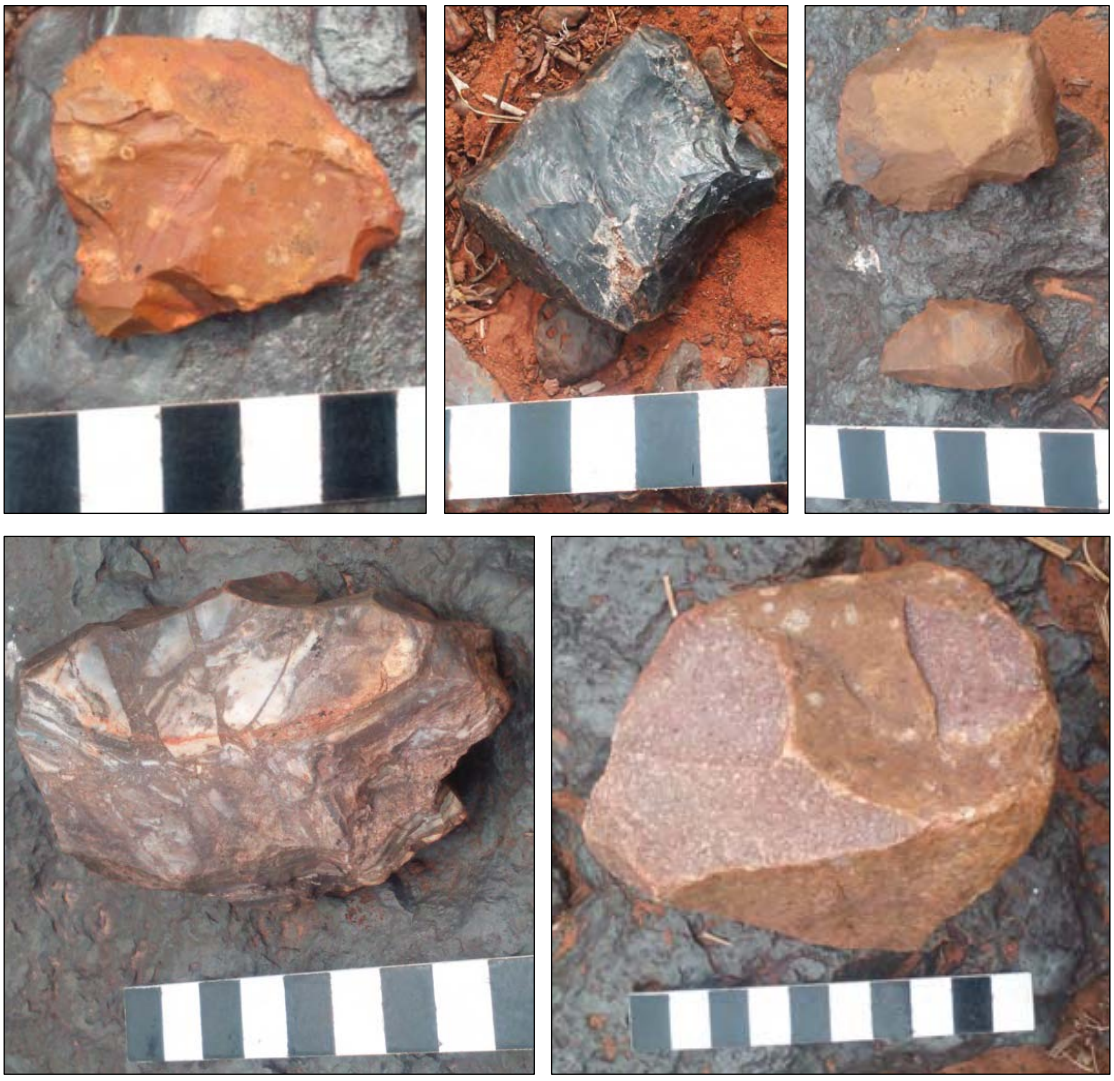


Figure 46 – Sample of MSA lithics observed at site JNK 5. From the top left corner, in a clockwise order, these photographs depict a core, awl, scrapers, scraper and core. All photographs by Dr. Maria van der Ryst. Scale in 1 cm increments.

Figure 47 – Two more lithics observed at the site, namely a small handaxe (left) and LSA quartz core (right). Both photographs by Dr. Maria van der Ryst. Scale in 1 cm increments.

9.2.6 JNK 6

Site Coordinates:

S 27° 55' 13.4"
E 23° 00' 51.0"

Site Description:

This site comprises a small shelter with rock art located against a rocky ledge on the lower slopes of the hill on which site JNK 5 is situated. The rock shelter faces toward the south with views of the dry river bed and valley below.

Only one panel comprising four images in red ochre could be identified. Furthermore, low densities of LSA lithics were found on the dripline of the rock shelter. An activity area where stone tools were manufactured *in situ,* was also recorded In the immediate surroundings of the rock shelter. During the field survey for an Archaeological Impact Assessment by (Webley & Halkett, 2010), two LSA lithics were identified on the same rocky ledge. These two lithics are located 93 m south-east of the rock shelter.

Sites with engravings occur more commonly in the study region than painted sites (Collins 1973; Beaumont and Boshier 1974; Morris 1988; Pelser and Van Vollenhoven 2010; Webley and Halkett 2010a, 2010b; Orton 2014; Rossouw n.d). Nearby engraved localities include Beeshoek, Paling and Daniëlskuil. See Birkholz (2013, 2014) for more detail on the Beeshoek and Paling localities. The Jenkins painted site is therefore of particularly high significance.

The site is not directly impacted by any of the proposed development footprints, but is located within the periphery of the blasting area surrounding the magazine and is also in proximity to the western boundary of the proposed pit.

The site extends over an area roughly 50 m by 50 m.

Site Significance:

The site comprises a rock shelter, with rock paintings and low levels of LSA stone tools.

As discussed, sites with engravings occur more commonly in the surroundings of the study area than painted sites. The Jenkins painted site is therefore of particularly high significance, namely Local Significance Grade 3B (LS. 3B).

Figure 48 - Two views of the rock shelter. The position of the painted panel is marked.

Figure 49 - The painted panel at site JNK 6.

Figure 50 - LSA stone tools observed on the drip line of the rock shelter. Scale is in 1 cm increments. Photograph by Dr. Maria van der Ryst.

9.2.7 JNK 7

Site Coordinates:

S 27° 55' 55.3"
E 23° 00' 21.1"

Site Description:

Five crescent-shaped stone structures were identified on a low ridge, overlooking the valley. The layout and appearance of the five structures suggest that they had a military or defensive purpose. This said, no loopholes could be identified in the structure. Furthermore, no historical cultural material could be found on the surface of the site. A low density scatter of lithics were observed on the surface of the site. The site extends over an area roughly 60m by 60m.

The historic research undertaken for the present study has revealed a number of events which may have necessitated the construction of a defensive position such as is suggested by the tangible remains at site JNK 7. These include the Griqualand West Rebellion of 1878, the Langberg Rebellion of 1897, the South African War (1899 – 1902) and the Boer Rebellion (1914 – 1915). Based on information that is presently available, the closest known military position to the site is associated with the Langberg Rebellion of 1897 and entailed the occupation of Mokaneng (Mokanen) by the No. 13 (Papkuil) Mounted Rifle Club under command of Captain Pringle in June 1897. Although site JNK 7 is located 2.2 km from the southern boundary of the farm Mokaneng, all the farms from this area were only surveyed in November 1897, after the cessation of hostilities. It seems highly likely that at the time of the Langberg Rebellion, site JNK 7 was located in proximity to a place vernacularly known as Mokaning or Mokanen, and with the surveying of the farms in November 1897 happened to fall on an adjacent property now known as Jenkins. Additionally, the survey diagram for Jenkins compiled in November 1897 indicate that the farm enclosed an area where three or four roads came together. The placement of site JNK 7 on this farm makes strategic sense.

Site Significance:

The site has scientific, historic and emotional significance. The site is deemed to be of Medium to High Significance i.e. Generally Protected 4A (GP.4A).

Figure 51 - General view of site JNK 7. The crescent-shaped structures can be seen.

Figure 52 - Closer view of one of the crescent-shaped stone structures at site JNK 7.

10 IMPACT OF PROPOSED DEVELOPMENT ON HERITAGE RESOURCES

10.1 Introduction

A total of seven heritage sites were identified during the fieldwork carried out by PGS Heritage in 2015. As the fieldwork was focussed on the proposed development footprints, it is not surprising that six of the seven heritage sites are located within the actual footprints of the proposed mining development. The exception is JNK 6, the rock art site, which is not located within any proposed footprint areas. However, this site is situated on the periphery of the buffer area around the explosives magazine (463 m from the magazine) and 131 m from the proposed pit.

The impact assessment of the proposed development on all seven identified heritage sites will be outlined below.

10.2 Risk Calculation for the Impact of the Proposed Development on JNK 1

In this section the impact of the proposed development on JNK 1 will be established. The overlay of the identified heritage sites on the development layout plan has shown that the site will be destroyed by the construction of the Road Linking.

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

$$\text{Impact Risk} = \frac{(4 + 2 + 5)}{3} \text{ X } \frac{4}{5}$$

IMPACT RISK = 2.93

Table 10: Risk Calculation for the Development Impact on JNK 1

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Study Area	Permanent	Very Likely	**Moderate**
Impact on JNK 1	4	2	5	4	**2.93**

This calculation has revealed that the impact risk of the proposed development on JNK 1 falls within Impact Class 3, which represents a Moderate Impact Risk. Mitigation is required.

10.3 Risk Calculation for the Impact of the Proposed Development on JNK 2

In this section the impact of the proposed development on JNK 2 will be established. The overlay of the identified heritage sites on the development layout plan has shown that the proposed Processed Ore Stockpile Area will be constructed at a distance of 28.4 m from the farmhouse. This farmhouse is estimated to be older than 60 years and younger than 100 years. The associated farmstead comprising structures and buildings younger than 60 years will be destroyed by the proposed development. Similarly, the midden associated with the farmhouse will also be destroyed by the development. This said, these structures younger than 60 years as well as the midden (younger than 100 years) are not believed to be of any heritage value. In the section that follows, the impact of the proposed development on the heritage significant farmhouse will be established.

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

$$\text{Impact Risk} = \frac{(3 + 3 + 4)}{3} \times \frac{4}{5}$$

IMPACT RISK = 2.7

Table 11: Risk Calculation for Development Impact on JNK 2

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Moderate	Local	Long Term	Very Likely	**Moderate**
Impact on JNK 2	3	3	4	4	**2.7**

This calculation has revealed that the impact risk of the proposed development on JNK 2 falls within Impact Class 3, which represents a Moderate Impact Risk. Mitigation is required.

10.4 Risk Calculation for the Impact of the Proposed Development on JNK 3

In this section the impact of the proposed development on JNK 3 will be established. The overlay of the identified heritage sites on the development layout plan has shown that sections of the site will be destroyed by the proposed construction of a Rail Loop.

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

$$\text{Impact Risk} = \frac{(4 + 2 + 5)}{3} \times \frac{4}{5}$$

IMPACT RISK = 2.93

Table 12: Risk Calculation for Development Impact on JNK 3

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Study Area	Permanent	Very Likely	**Moderate**
Impact on JNK 3	4	2	5	4	**2.93**

This calculation has revealed that the impact risk of the proposed development on JNK 3 falls within Impact Class 3, which represents a Moderate Impact Risk. Mitigation is required.

10.5 Risk Calculation for the Impact of the Proposed Development on JNK 4

In this section the impact of the proposed development on JNK 4 will be established. The overlay of the identified heritage sites on the development layout plan has shown that the site is 17.8 m from the proposed Rail Loop.

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

$$\text{Impact Risk} = \frac{(4 + 3 + 4)}{3} \times \frac{3}{5}$$

IMPACT RISK = 2.2

Table 13: Risk Calculation for Development Impact on JNK 4

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Local	Long Term	Could Happen	**Moderate**
Impact on JNK 4	4	3	4	3	**2.2**

This calculation has revealed that the impact risk of the proposed development on JNK 4 falls within Impact Class 3, which represents a Moderate Impact Risk. Mitigation is required.

10.6 Risk Calculation for the Impact of the Proposed Development on JNK 5

In this section the impact of the proposed development on JNK 5 will be established. The overlay of the identified heritage sites on the development layout plan has shown that the site is located immediately to the east of the proposed Pit.

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

$$\text{Impact Risk} = \frac{(3 + 2 + 4)}{3} \times \frac{4}{5}$$

IMPACT RISK = 2.7

Table 14: Risk Calculation for Development Impact on JNK 5

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Moderate	Study Area	Long Term	Very Likely	**Moderate**
Impact on JNK 5	3	2	4	4	**2.7**

This calculation has revealed that the impact risk of the proposed development on JNK 5 falls within Impact Class 3, which represents a Moderate Impact Risk. Mitigation is required.

10.7 Risk Calculation for the Impact of the Proposed Development on JNK 6

In this section the impact of the proposed development on JNK 6 will be established. The overlay of the identified heritage sites on the development layout plan has shown that the site is located within the outer periphery of the buffer area surrounding the proposed Explosive Magazine, being 463 m from the magazine. Additionally, the site is also located 131 m west of the proposed Pit, and is located well within the buffer area surrounding the pit.

Possibly the biggest potential threats to the site include mining-related blasting, dust and vibration.

As the site is located within the outer periphery of the buffer surrounding the Explosive Magazine, it seems highly unlikely for any impacts relating to the magazine to materialize during the operation of the mine. Even within the excesses of a catastrophic event, such as the accidental discharge of the explosives from within the magazine, the position of the site on the outer periphery of the buffer zone suggest that little impact can be expected on the site.

The site is located 131 m from the proposed pit. The mining process at the pit would include planning, drilling, blasting, loading and hauling. All rock fragmentation would be undertaken by blasting and drilling. It is therefore clear that the mining of the pit has the potential to have an impact on the rock art at site JNK 6. However, it must be noted that the rock art is located 131 m from the edge of the pit and its geographic position against the southern wall of a rocky ledge with the rock part panel facing toward the south, indicates that it is in a protected position facing away from the pit.

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

$$\text{Impact Risk} = \frac{(5 + 4 + 5)}{3} \times \frac{3}{5}$$

IMPACT RISK = 2.8

Table 15: Risk Calculation for Development Impact on JNK 6

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	High	Regional	Permanent	Could Happen	**Moderate**
Impact on JNK 6	5	4	5	3	**2.8**

This calculation has revealed that the impact risk of the proposed development on JNK 6 falls within Impact Class 3, which represents a Moderate Impact Risk. Mitigation is required.

10.8 Risk Calculation for the Impact of the Proposed Development on JNK 7

In this section the impact of the proposed development on JNK 7 will be established. The overlay of the identified heritage sites on the development layout plan has shown that the site will be destroyed by the proposed Waste Rock Dump.

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

$$\text{Impact Risk} = \frac{(3 + 3 + 5)}{3} \times \frac{5}{5}$$

IMPACT RISK = 3.7

Table 16: Risk Calculation for Development Impact on JNK 7

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Medium	Local	Permanent	Will Happen	**High**
Impact on JNK 7	3	3	5	5	**3.7**

This calculation has revealed that the impact risk of the proposed development on JNK 7 falls within Impact Class 4, which represents a High Impact Risk. Mitigation is required.

11 MITIGATION MEASURES AND GENERAL RECOMMENDATIONS

The five risk calculations above have shown that the impact risk of the proposed development on sites JNK 1, JNK 2, JNK 3, JNK 4, JNK 5 and JNK 6 will all fall within Impact Class 3 representing a Medium Impact Risk. The impact risk for the proposed development on site JNK 7 falls within Impact Class 4 representing a High Impact Risk.

It is clear that mitigation would be required for all seven sites. The required mitigation for each of these sites will be individually discussed below.

11.1 Mitigation Required for JNK 1

The following mitigation measures are required for JNK 1:

- A collection of the lithics should be made as the locality was clearly a focus point on the landscape and was frequented by hunting and gathering groups.
- In addition, an investigation using Shovel Test Pits (STP's) in the red sands will establish whether subsurface deposits are indeed present.

- The proposed infrastructural developments include the construction of offices on the ridge above the site. It is proposed that the lithic collection may be housed at the office to serve as a small exhibition on the prehistory of the local region.
- A permit would be required from the South African Heritage Agency (SAHRA) for the mitigation measures as well as the small exhibition of collected material.
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

11.2 Mitigation Required for JNK 2

The following mitigation measures are required for JNK 2:

- The farmhouse and farmstead in its entirety must be recorded using photographs and a surveyed site layout plan.
- The farmhouse and structures in its immediate surroundings (including the outside toilet and small rectangular structure with annex) must be recorded with measured drawings and photographs. Such measures drawings must include facades and plans.
- A report must be compiled containing the results of the recording activity.
- An application must be lodged with the relevant heritage authority to obtain a permit allowing for the disturbance to the old farmhouse and adjacent structures.

11.3 Mitigation Required for JNK 3

Hunter-gatherers view land as an integral part of their identity. Each group has a defined territory with a collection of natural resources on which they depend for survival (Marshall 1976; Barnard 2011). Ownership implies access to the resources of this area, an inalienable right which is acquired by non-exclusive inheritance and utilization. A main subsistence strategy in the planning of hunting and gathering trips is to limit the duration and the distances to be covered. Primary territories also included a permanent or semi-permanent waterhole (Smith 1999), such as the pans, springs and annual watercourses, along with other resources, in particularly plant foods. Investigations of pan localities suggest relatively short visits over time by small groups of people.

The following mitigation measures are required for JNK 3:

- In view of the future development it is recommended that the pan site should be mitigated through sampling of lithics from areas of higher densities.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

11.4 Mitigation Required for JNK 4

The following mitigation measures are required for JNK 4.

An attempt must be made to preserve the possible grave *in situ.* To achieve this, the following would be required:

- Demarcate a 5m buffer around the possible grave.
- Erect a fence (preferably a palisade one) with lockable gate around the possible grave.
- In the event that the possible grave cannot be excluded from the development footprint, a grave relocation process, as outlined below, needs to be implemented.

Whenever a grave relocation process is required, it must include the following:

- A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin so as to obtain their consent for the relocation of the grave. This social consultation would also assist in obtaining information on the possible grave to see if it is indeed a grave or not.
- Bilingual site notices indicating the intent of the excavation / relocation
- Bilingual newspaper notices indicating the intent of the excavation / relocation
- Permits from the relevant authorities.
- An archaeological excavation of the possible grave to assess whether a grave is located here.
- Should a grave be found, an exhumation process must be implemented that keeps the dignity of the remains and family intact and will safeguard the legal rights of the families as well as that of the development company.
- The process must be done by a reputable company well versed in grave mitigation.

11.5 Mitigation Required for JNK 5

Although the lithics from the site occur in a dispersed fashion, the observed stone tools comprise a significant sample of formal tools. It is accordingly recommended that a collection of the lithics should be made. A small biface was also recorded. Similar small handaxes are considered to be an iconic tool type of transitional Earlier Stone Age (ESA) and MSA assemblages. The range of tool types, the diversity of raw materials as well as the presence of formal tools types reflect various instances of site utilization over a very long period of time. As the lithics were surface finds it is moreover likely that sub-surface assemblages may be present.

The following mitigation measures are required for JNK 5:

- A collection of the lithics should be made as the locality was clearly a focus point on the landscape that was frequented over time.
- In addition, an investigation through Shovel Test Pits (STP's) would establish whether subsurface deposits are present.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

11.6 Mitigation Required for JNK 6

The archaeological site is on the edge of the proposed buffer area around the Explosive Magazine (the site is 463 m from the magazine) and is located 130 m from the proposed mine pit. The site will be impacted upon. The visual impact from mining will be high and, in addition, the proposed activities will impact on the sense of place. Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer' (EIMS 2012:8). 'Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area (EIMS 2012:7-8). The locality complies with these criteria.

The outcrop and associated features signify an important heritage resource. Heritage sites are unique social spaces with tangible and intangible remains that reflect how the locality featured in the minds and the experience of past communities (Garden 2006:394). The concept of a past landscape is also referred to as a heritage scape. The boundaries of a place contribute to a sense of place. The particular setting within the larger landscape would have been important in how a particular locality was used and cognitively experienced by the prehistoric and/or historic hunter-gatherers that frequented this locality.

Mosler (2009:25) argues that 'archaeological sites are composed of unique, complex landscape settings including architectural remains, visually and spatially interrelated spaces, and ecologies with topographical features and landforms framing them'. A visual landscape–oriented approach as a tool for the sustainable conservation should feature in the presentation of heritage sites (Mosler 2009:25). A historic landscape comprises more than archaeological remains in referencing topographical formations, patterns of land use and also sociocultural values, traditions, and identities. The line of sight (Garden 2006), or what in architectural terms is the integrity of the skyline (Sanders et al 2013), is particularly important to capture the past and visitor experience of a site. Visual impact is defined as '[a]ny modification in land forms, water bodies, or vegetation, or any introduction of structures, which negatively or positively affect the visual character or quality of a landscape' (http://teeic.indianaffairs.gov/glossary/glossary.htm#595).

The shelter lies on the edge of the proposed blasting zone. Additional risks to heritage resources emanate from not only cumulative impacts of mining to extract the ore but also noise and dust pollution, and possible damage from surface waves caused by blasting (Hedlin et al. 2002), earth moving activities, access roads and ancillary facilities, etc.

As is shown below, the small painted shelter falls within a sensitive landscape threatened by large scale mining. We recommend that the painted shelter should be protected by a buffer zone.

The following mitigation measures are required for JNK 6:

- A 100m buffer area surrounding the rock shelter must be kept free of any development.

- The site must be recorded using accepted practice and techniques.
- An archaeological monitoring program must be implemented to monitor the rock art site during the Construction and Mining Phases of the proposed development. Any impacts on the site identified during these monitoring visits must be addressed swiftly, including the recommendation and implementation of additional mitigation measures. Such measures may include the expansion of the buffer area and increased monitoring frequency.
- The frequency of monitoring visits can start off at one visit every two weeks during the Construction and Mining Phases. Each of these monitoring visits must be preceded by a monitoring report containing the observations and photographs of the particular monitoring visit. Recommendations must also be made.
- All monitoring must be undertaken by a suitable qualified and experienced archaeologist.

11.7 Mitigation Required for JNK 7

The following mitigation measures are required for JNK 7:

- The site must be recorded with photographs and a layout plan.
- A permit application must be lodged with the South African Heritage Resources Agency (SAHRA) to allow for the subsequent mitigation measures to be implemented.
- Once the permit is received, a metal detector must be used to investigate the site. This must be augmented by a Shovel Test Pits (STP's) investigation. Both techniques will be used to further assess and interpret the site.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced archaeologist.

12 CONCLUSIONS AND FINDINGS

PGS Heritage was appointed by Synergistics Environmental Services to carry out a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed Coza Iron Ore Project located on the Remainder and Portion 1 of the farm Jenkins 562. The study area is located south-west of Kathu, east of Olifantshoek and north of Postmasburg and is located in the Tsantsabane Local Municipality of the Northern Cape Province.

Archival and Historical Desktop Study

The work commenced with an archival and historical desktop study. This study comprised an assessment of the available archival and historical maps as well as a compilation of a historic overview of the study area and surroundings. The following observations can be made as a result of the archival and historical study:

- In 1886 the farm formed part of the newly established "Langberg Native Reserve".
- The Langberg Rebellion of 1897 represents one of the more significant historic events associated with this area. During the rebellion, on 14 June 1897, the No. 13 (Papkuil) Mounted Rifle Club was ordered to occupy "Mokanen". The farm Mokaneng is located immediately to the north-east of Jenkins.
- After the events of the 1897 rebellion, the Langberg Reserve was confiscated by the British Authorities.
- The farm Jenkins would have been surveyed by land surveyor J.C. Wessels and his assistant D. Roos in November 1897.
- During the late nineteenth century the farm Jenkins was occupied by H.J. Delport.
- H.J. Delport transferred the farm to P.M. de Kock in 1905.
- A portion of the farm known as Mooihoek was transferred from P.M. de Kock to J.J. de Kock on 12 February 1919. This portion represents a significant section of the present study area.

Previous Archaeological Research and Studies

Previous studies conducted in the surroundings of the study area have identified a number of archaeological sites. These include Stone Age (ESA, MSA and LSA) sites including find spots,

surface scatters and rock art sites; pre-colonial specularite mining sites; historic structures and buildings; historic mining sites as well as graves and cemeteries.

Due to the arid nature of the surroundings of the study area, it seems likely for many of the archaeological site types (with the possible exception of pre-colonial and historical mine sites) to be concentrated in proximity to water sources such as riverine edges and pans.

This desktop study study has highlighted the archaeological potential of the study area and surroundings thereby underlining the need for archaeological fieldwork to be undertaken of the proposed development footprint area. During the fieldwork a total of seven sites were identified, of which six couldclearly be identified as archaeological sites. The fieldwork findings are discussed in more detail below.

Palaeontology

The farm Jenkins is underlain by Vaalian aged Gamagara and Ongeluk Formations of the Olifantshoek Group, Griqualand West Supergroup and Tertiary aged surface limestone or calcretes. The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 of the main report.

The Vaalian aged Gamagara and Ongeluk Formations are allocated a Moderate Palaeontological sensitivity and the recording of micro-fossils during detailed analyses of ore samples must be reported to SAHRA. This requirement however does not fall within the scope of the EMP of the project and is of academic interest only. A High sensitivity rating for Palaeontological Heritage is allocated to the area of the farm underlain by surface limestone. Mining activity in this area is however restricted to surface infrastructure and no significant fossil finds are expected.

The following recommendations are made in terms of palaeontology:

4. The EAP as well as the ECO for this project must be made aware of the fact that sediments of the Gamagara and Ongeluk Formations, Olifanthoek Group, contain

significant fossil remains, albeit mostly stromatolite structures and micro-fossils. The calcrete deposits can contain significant remains of Tertiary aged animals.

5. A High Palaeontological sensitivity is allocated to surface limestones and a Moderate Sensitivity to the rest of the area. If any fossils, most notably stromoatolite structures, are recorded during investigations of the ore bodies the ECO must be notified and a qualified palaeontologist must be appointed to report these finds to SAHRA by conducting of a Phase 1 PIA investigation.
6. No further mitigation for Palaeontological Heritage is recommended for this development.

Fieldwork Findings

A total of seven heritage sites were identified within the proposed development footprints located on the farm Jenkins 562. The table below provides an overview of all sevem these identified heritage sites.

Site	Latitude	Longitude	Description	Significance
JNK 1	27° 55' 25.9S	22° 59' 13.7"E	Surface scatter of MSA and LSA lithics.	Medium
JNK 2	27° 54' 56.0"S	22° 59' 26.7"E	Historic farmstead older than 60yrs and an associated low density midden.	Medium
JNK 3	27° 54' 51.1"S	22° 58' 50.0"E	MSA/LSA lithics around a pan.	Medium
JNK 4	27° 54' 46.2"S	22° 58' 50.0"E	Rectangular stone structure, possible grave.	Medium - High
JNK 5	27° 55' 15.8"S	23° 01' 23.1"E	Low density surface scatter of MSA lithics.	Medium
JNK 6	27° 55' 13.4"S	23° 00' 51.0"E	Rock shelter with Rock Art and low density surface scatter LSA lithics.	High
JNK 7	27° 55' 55.3"S	23° 00' 21.1"E	Five crescent-shaped stone structures, possibly associated with the events of 1897.	Medium - High

An overlay of these seven heritage sites was made over the available mining development layout plan. From this it is evident that sites JNK 1, JNK 3, JNK 5 and JNK 7 will be directly

impacted upon by the proposed development. This said, impacts are also expected on sites located in close proximity to the mining development footprints, including JNK 2, JNK 4 and JNK 6.

Impact Assessment

Assessments were made of the impact risk of the proposed mining development on these five heritage sites. These calculations have revealed that the impact risk of the proposed development on six of the seven identified sites (JNK 1, JNK 2, JNK 3, JNK 4, JNK 5 and JNK 6) fall within Impact Class 3, which represents a Moderate Impact Risk. Furthermore, the impact risk of the proposed development on site JNK 7 falls within Impact Class 4, which represents a High Impact Risk.

As a result, mitigation would be required for all the sites.

Mitigation

The following mitigation measures would be required for the identified heritage sites.

Mitigation Measures required for JNK 1:

The following mitigation measures are required for JNK 1:

- A collection of the lithics should be made as the locality was clearly a focus point on the landscape and was frequented by hunting and gathering groups.
- In addition, an investigation using Shovel Test Pits (STP's) in the red sands will establish whether subsurface deposits are indeed present.
- The proposed infrastructural developments include the construction of offices on the ridge above the site. It is proposed that the lithic collection may be housed at the office to serve as a small exhibition on the prehistory of the local region.
- A permit would be required from the South African Heritage Agency (SAHRA) for the mitigation measures as well as the small exhibition of collected material.
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

Mitigation Measures required for JNK 2:

The following mitigation measures are required for JNK 2:

- The farmhouse and farmstead in its entirety must be recorded using photographs and a surveyed site layout plan.
- The farmhouse and structures in its immediate surroundings (including the outside toilet and small rectangular structure with annex) must be recorded with measured drawings and photographs. Such measures drawings must include facades and plans.
- A report must be compiled containing the results of the recording activity.
- An application must be lodged with the relevant heritage authority to obtain a permit allowing for the disturbance to the old farmhouse and adjacent structures.

Mitigation Measures required for JNK 3:

The following mitigation measures are required for JNK 3:

- In view of the future development it is recommended that the pan site should be mitigated through sampling of lithics from areas of higher densities.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

Mitigation Measures required for JNK 4:

The following mitigation measures are required for JNK 4.

An attempt must be made to preserve the possible grave *in situ.* To achieve this, the following would be required:

- Demarcate a 5m buffer around the possible grave.
- Erect a fence (preferably a palisade one) with lockable gate around the possible grave.

- In the event that the possible grave cannot be excluded from the development footprint, a grave relocation process, as outlined below, needs to be implemented.

Whenever a grave relocation process is required, it must include the following:

- A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin so as to obtain their consent for the relocation of the grave. This social consultation would also assist in obtaining information on the possible grave to see if it is indeed a grave or not.
- Bilingual site notices indicating the intent of the excavation / relocation
- Bilingual newspaper notices indicating the intent of the excavation / relocation
- Permits from the relevant authorities.
- An archaeological excavation of the possible grave to assess whether a grave is located here.
- Should a grave be found, an exhumation process must be implemented that keeps the dignity of the remains and family intact and will safeguard the legal rights of the families as well as that of the development company.
- The process must be done by a reputable company well versed in grave mitigation.

Mitigation Measures required for JNK 5:

The following mitigation measures are required for JNK 5:

- A collection of the lithics should be made as the locality was clearly a focus point on the landscape that was frequented over time.
- In addition, an investigation through Shovel Test Pits (STP's) would establish whether subsurface deposits are present.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced Stone Age specialist.

Mitigation Measures required for JNK 6:

The following mitigation measures are required for JNK 6:

- A 100m buffer area surrounding the rock shelter must be kept free of any development.
- The site must be recorded using accepted practice and techniques.
- An archaeological monitoring program must be implemented to monitor the rock art site during the Construction and Mining Phases of the proposed development. Any impacts on the site identified during these monitoring visits must be addressed swiftly, including the recommendation and implementation of additional mitigation measures. Such measures may include the expansion of the buffer area and increased monitoring frequency.
- The frequency of monitoring visits can start off at one visit every two weeks during the Construction and Mining Phases. Each of these monitoring visits must be preceded by a monitoring report containing the observations and photographs of the particular monitoring visit. Recommendations must also be made.
- All monitoring must be undertaken by a suitable qualified and experienced archaeologist.

Mitigation Measures required for JNK 7:

The following mitigation measures are required for JNK 7:

- The site must be recorded with photographs and a layout plan.
- A permit application must be lodged with the South African Heritage Resources Agency (SAHRA) to allow for the subsequent mitigation measures to be implemented.
- Once the permit is received, a metal detector must be used to investigate the site. This must be augmented by a Shovel Test Pits (STP's) investigation. Both techniques will be used to further assess and interpret the site.
- A Phase 2 Archaeological Mitigation report must be compiled.
- The abovementioned report and destruction permit application must be lodged with the South African Heritage Resources Agency (SAHRA).
- The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced archaeologist.

Conclusions

On the condition that the mitigation measures outlined in this report are undertaken, the development is not expected to have any significant impact on heritage sites. As such no heritage reasons can be given for the development not to continue.

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12.3 Archival References

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12.5 Historic Topographic Maps

All the historic topographic maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development and Land Reform in Cape Town.

12.6 Contemporary Cartographic Data

MapSource and Google Earth were used to depict contemporary cartographic data.

Appendix A

LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

1. GENERAL PRINCIPLES

In areas where there has not yet been a systematic survey to identify conservation-worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been completed and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In terms of the heritage legislation, permits are required to damage, destroy, alter, or disturb such sites. People who already possess such material are required to register it. The management of heritage resources is integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued or mitigated.

In addition to the formal protection of culturally significant graves, all graves which are older than 60 years and are not in a cemetery (such as ancestral graves in rural areas) are protected. The legislation protects the interests of communities who have an interest in the graves: they must be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle should be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the applicant's (i.e. mining company or development company) cost. Thus, the applicant will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;

- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and prehistoric cultural remains, including graves and human remains.

2. GRAVES AND CEMETERIES

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and National Health Act (Act 61 0f 2003) and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and National Health Act (Act 61 0f 2003) and are the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Appendix B

CURRICULUM VITAE

PROFESSIONAL CURRICULUM
FOR POLKE DOUSSY BIRKHOLTZ

Name: Polke Doussy Birkholtz

Date & Place of Birth: 9 February 1975 – Klerksdorp, North West Province, South Africa

Place of Tertiary Education & Dates Associated:

Institution: University of Pretoria
Qualification: BA (Cum Laude) - Bachelor of Arts Specializing in Archaeology, History & Anthropology
Date: 1996

Institution: University of Pretoria
Qualification: BA Hons (Cum Laude) - Bachelor of Arts with Honours Degree Specializing in Archaeology
Date: 1997

Qualifications:

BA	-	Degree specialising in Archaeology, History and Anthropology
BA Hons	-	Professional Archaeologist

Memberships:

Association of Southern African Professional Archaeologists (ASAPA)
Professional Member of the CRM Section of ASAPA

Overview of Post Graduate Experience:

1997 – 2000 – Member/Archaeologist – Archaeo-Info
2001 – 2003 – Archaeologist/Heritage Specialist – Helio Alliance
2000 – 2008 – Member/Archaeologist/Heritage Specialist – Archaeology Africa
2003 - Present – Director / Archaeologist / Heritage Specialist – PGS Heritage

Languages: English: Speak, Read & Write & Afrikaans: Speak, Read & Write

Total Years' Experience: 17 Years

Experience Related to the Scope of Work:

- Polke has worked as a **HERITAGE SPECIALIST / ARCHAEOLOGIST / HISTORIAN** on more than 270 projects, and acted as **PROJECT MANAGER** on almost all of these projects. His experience include the following:

    - Development of New Sedimentation and Flocculation Tanks at Rand Water's Vereeniging Pumping Station, Vereeniging, Gauteng Province. Heritage Impact Assessment for *Greenline*.
    - EThekwini Northern Aqueduct Project, Durban, KwaZulu-Natal. Heritage Impact Assessment for *Strategic Environmental Focus*.
    - Johannesburg Union Observatory, Johannesburg, Gauteng Province. Heritage Inventory for *Holm Jordaan*.

- Development at Rand Water's Vereeniging Pumping Station, Vereeniging, Gauteng Province. Heritage Impact Assessment for *Aurecon*.
- Comet Ext. 8 Development, Boksburg, Gauteng Province. Phase 2 Heritage Impact Assessment for *Urban Dynamics*.
- Randjesfontein Homestead, Midrand, Gauteng Province. Baseline Heritage Assessment with Nkosinathi Tomose for Johannesburg City Parks.
- Rand Leases Ext. 13 Development, Roodepoort, Gauteng Province. Heritage Impact Assessment for *Marsh*.
- Proposed Relocation of the Hillendale Heavy Minerals Plant (HHMP) from Hillendale to Fairbreeze, KwaZulu-Natal. Heritage Impact Assessment for *Goslar Environmental*.
- Portion 80 of the farm Eikenhof 323 IQ, Johannesburg, Gauteng Province. Heritage Inventory for *Khare Incorporated*.
- Comet Ext. 14 Development, Boksburg, Gauteng Province. Heritage Impact Assessment for *Marsh*.
- Rand Steam Laundries, Johannesburg, Gauteng Province. Archival and Historical Study for *Impendulo* and *Imperial Properties*.
- Mine Waste Solutions, near Klerksdorp, North West Province. Heritage Inventory for *AngloGold Ashanti*.
- Consolidated EIA and EMP for the Kroondal and Marikana Mining Right Areas, North West Province. Heritage Impact Assessment for *Aquarius Platinum*.
- Wilkoppies Shopping Mall, Klerksdorp, North West Province. Heritage Impact Assessment for *Centre for Environmental Management*.
- Proposed Vosloorus Ext. 24, Vosloorus Ext. 41 and Vosloorus Ext. 43 Developments, Ekurhuleni District Municipality, Gauteng Province. Heritage Impact Assessment for *Enkanyini Projects*.
- Proposed Development of Portions 3, 6, 7 and 9 of the farm Olievenhoutbosch 389 JR, City of Tshwane Metropolitan Municipality, Gauteng Province. Heritage Impact Assessment for *Marsh*.
- Proposed Development of Lotus Gardens Ext. 18 to 27, City of Tshwane Metropolitan Municipality, Gauteng Province. Heritage Impact Assessment for *Pierre Joubert*.
- Proposed Development of the site of the old Vereeniging Hospital, Vereeniging, Gauteng Province. Heritage Scoping Assessment for *Lekwa*.
- Proposed Demolition of an Old Building, Kroonstad, Free State Province. Phase 2 Heritage Impact Assessment for *De Beers Consolidated Mines*.
- Proposed Development at Westdene Dam, Johannesburg, Gauteng Province. Heritage Impact Assessment for *Newtown*.
- West End, Central Johannesburg, Gauteng Province. Phase 1 Heritage Impact Assessment for the *Johannesburg Land Company*.
- Kathu Supplier Park, Kathu, Northern Cape Province. Heritage Impact Assessment for *Synergistics*.
- Matlosana 132 kV Line and Substation, Stilfontein, North West Province. Heritage Impact Assessment for *Anglo Saxon Group* and *Eskom*.
- Marakele National Park, Thabazimbi, Limpopo Province. Cultural Resources Management Plan for *SANParks*.
- Cullinan Diamond Mine, Cullinan, Gauteng Province. Heritage Inventory for *Petra Diamonds*.
- Highveld Mushrooms Project, Pretoria, Gauteng Province. Heritage Impact Assessment for *Mills & Otten*.
- Development at the Reserve Bank Governor's Residence, Pretoria, Gauteng Province. Archaeological Excavations and Mitigation for the *South African Reserve Bank*.

- Proposed Stones & Stones Recycling Plant, Johannesburg, Gauteng Province. Heritage Scoping Report for *KV3*.
- South East Vertical Shaft Section of ERPM, Boksburg, Gauteng Province. Heritage Scoping Report for *East Rand Proprietary Mines*.
- Proposed Development of the Top Star Mine Dump, Johannesburg, Gauteng Province. Detailed Archival and Historical Study for *Matakoma.*
- Soshanguve Bulk Water Replacement Project, Soshanguve, Gauteng Province. Heritage Impact Assessment for *KWP*.
- Biodiversity, Conservation and Participatory Development Project, Swaziland. Archaeological Component for *Africon*.
- Camdeboo National Park, Graaff-Reinet, Eastern Cape Province. Cultural Resources Management Plan for *SANParks*.
- Main Place, Central Johannesburg, Gauteng Province. Phase 1 Heritage Impact Assessment for the *Johannesburg Land Company*.
- Modderfontein Mine, Springs, Gauteng Province. Detailed Archival and Historical Study for *Consolidated Modderfontein Mines.*
- Proposed New Head Office for the Department of Foreign Affairs, Pretoria, Gauteng Province. Heritage Impact Assessment for *Holm Jordaan Group*.
- Proposed Modification of the Lukasrand Tower, Pretoria, Gauteng Province. Heritage Assessment for IEPM.
- Proposed Road between the Noupoort CBD and Kwazamukolo, Northern Cape Province. Heritage Impact Assessment for *Gill & Associates*.
- Proposed Development at the Johannesburg Zoological Gardens, Johannesburg, Gauteng Province. Detailed Archival and Historical Study for *Matakoma.*

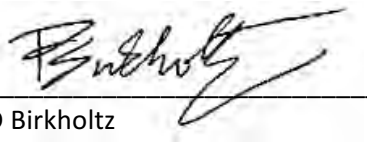
- Polke's **KEY QUALIFICATIONS:**

  - Project Management
  - Archaeological and Heritage Management
  - Archaeological and Heritage Impact Assessment
  - Archaeological and Heritage Fieldwork
  - Archival and Historical Research
  - Report Writing

- Polke's **INFORMATION TECHNOLOGY EXPERIENCE:**

  - MS Office – Word, Excel, & Powerpoint
  - Google Earth
  - Garmin Mapsource
  - Adobe Photoshop
  - Corel Draw

I Polke Doussy Birkholtz, hereby confirm that the above information contained in my CV is true and correct.



PD Birkholtz

12 October 2015
Date

Appendix C

PALAEONTOLOGICAL DESKTOP STUDY