PHASE 1 ARCHAEOLOGICAL AND HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROSPECTING RIGHT APPLICATION ON VARIOUS PORTIONS OF THE FARM BUFFELSDRAAI 151JQ: PORTION RE, 3, 4, 5, 22 & PORTION OF PORTION 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,20, 21, 23, 24, 25 26, WITHIN MADIBENG LOCAL MUNICIPALITY IN NORTH WEST PROVINCE.

DATE: APRIL 2021

Document Information

Item	Description
Proposed development and location	Prospecting Right Application on the farm Buffelsdraai 151 JQ in North West Province.
Purpose of the study	To carry out an archaeological and Heritage Impact Assessment to determine the presence/absence of cultural heritage sites and the impact of proposed prospecting.
1:50 000 Topographic Map	2527 BA Assen.
Coordinates	See Figure 1 and 2
Municipalities	Madibeng Local Municipality
Predominant land use of surrounding area	Agriculture, residential and Mining.
Applicant	Dikwena Minerals (Pty) Ltd, Spaces Broadacres, Block A, Willow Wood Office Park Broadacres, Johannesburg 2021
Reference No.	
EAP	Mukhadakhomu Environmental Services (Pty) Ltd 99 Bushypark, Mashamba, Makhado,0942 Tel: 076 560 8193, Fax: 0864714904 Email: sedzani@mukhadakhomu.com
Heritage Consultant	Integrated Specialist Services (Pty) Ltd Constantia Park, Building 16-2, 546, 16th Road, Midrand, 1685 Tel: 010 492 4330, Fax: 086 652 9774, Cell: 076 328 1558 / 071 685 9247 Email: trust@issolutions.co.za
Author	Trust Mlilo (Archaeology and Heritage Specialist)
Date of Report	13/02/ 2021

NATIONAL LEGISLATION AND REGULATIONS GOVERNING THIS REPORT

This is a specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014.

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence.

I, **Trust Mlilo**, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own, notwithstanding the fact that I have received fair remuneration from the client for preparation of this report.

Expertise:

Trust Mlilo, MA. (Archaeology), BA Hons, PDGE and BA & (Univ. of Pretoria) ASAPA (Professional member) with more than 15 years of experience in archaeological and heritage impact assessment and management. Mlilo is an accredited member of the Association for Southern African Professional Archaeologists (ASAPA), Amafa akwaZulu Natali and Eastern Cape Heritage Resources Agency (ECPHRA). He has conducted more than hundred AIA/HIA Studies, heritage mitigation work and heritage development projects over the past 15 years of service. The completed projects vary from Phase 1 and Phase 2 as well as heritage management work for government, parastatals (Eskom) and several private companies such as BHP Billiton, Rhino Minerals.

Independence

The views expressed in this document are the objective, independent views of Mr Trust Mlilo and the survey was carried out under Mukhadakhomu Environmental Services (Pty) Ltd. Integrated Specialist Services (Pty) Ltd has no business, personal, financial or other interest in the proposed development project apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Integrated Specialist Services (Pty) Ltd reserves the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field or pertaining to this investigation.

This report must not be altered or added to without the prior written consent of the author and Mukhadakhomu Environmental Services (Pty) Ltd. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

Authorship: This AIA/HIA Report has been prepared by Mr Trust Mlilo (Professional Archaeologist). The report is for the review of the Heritage Resources Agency (PHRA).

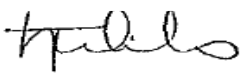
Geographic Co-ordinate Information: Geographic co-ordinates in this report were obtained using a hand-held Garmin Global Positioning System device. The manufacturer states that these devices are accurate to within +/- 5 m.

Maps: Maps included in this report use data extracted from the NTS Map and Google Earth Pro.

Disclaimer: The Authors are not responsible for omissions and inconsistencies that may result from information not available at the time this report was prepared.

The Archaeological and Heritage Impact Assessment Study was carried out within the context of tangible and intangible cultural heritage resources as defined by the SAHRA Regulations and Guidelines as to the authorisation of the prospecting right application being proposed by Dikwena Minerals (Pty) Ltd

Signed by



13/ 04/ 2021

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EXECUTIVE SUMMARY

Dikwena Minerals (Pty) Ltd is applying for a prospecting right on several portions of the farm Buffelsdraai 151JQ in the North West Province in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) approved on 17 May 2013. The initial heritage study was done by (Pelser 2020). The study recorded scatters of lithic tools within the proposed prospecting site. However, SAHRA interim comments dated 5th of February 2021 requested for a field-based palaeontology study to form part of the heritage impact assessment since the application footprint is located in areas of moderate, high and very high sensitivity for palaeontological resources as per the SAHRIS PalaeoSensitivity map. In addition, SAHRA requested that the HIA be revised to include a track-log of the conducted survey and that the assessment of significance and impact to the identified heritage resource to be made clearer. Therefore, this report was done to fulfil SAHRA's requests as presented in the interim comments dated 5th of February 2021 (CaseID: 15356). As such this current report must be read in conjunction with the initial HIA report by Pelser (2020). The prospecting right application site is located in an area that is predominantly residential, agriculture and mining (See Figure 3), and any listed development in this area must take full cognizance of potential occurrence heritage resources. Various national and provincial legislative arms mandate pre-development assessment to ensure protection of heritage resources. The rich geological and agricultural resources of the project area have also led to numerous farming and mining activities that had robed parts of the area's pristine environments. The implications of this observation are that whatever heritage resources that still exist in the area must be protected from any developments.

Archaeological resources in the general project area stretches into deep time starting with australopithecines. These australopithecines were gradually displaced by early hominid (Homo Habilis) that was later replaced by the early crude stone tool using hominid (Homo erectus around 1.8 million years ago). This marked the beginning of the Stone Age (ESA), which is not very widespread in the study area. Nonetheless the area has isolated occurrences of the Middle Stone Age (MSA) industries associated with anatomically modern humans, Homo sapiens that replaced the ESA around 250000 years ago. The subsequent replacement of the MSA by Later Stone Age (LSA) occurred from about 20000 years ago and the new technology is also represented in isolated occurrences. The LSA is triggered a series of technological innovations and social transformations within these early hunter-gatherer societies that included the advent of rock art (paining and engravings), associated with the Khoisan communities. From this period onwards, there has not been significant reports of Early Iron Age (AD200 to 1000) sites in the study area until the post 15th century Ntsuanatsatsi-Uitkomsts (Nguni-speakers) and Olifantsfontein and Buispoort (Sotho-Tswana speakers) period of Late Iron Age that is characterized by stone walling. Key historical events relate to the 19th century encroachment of Boer Trekkers and Mfecane fleeing Mzilikazi's Ndebele people, as well as the aftermaths of Boer-Anglo and European-African military encounters that resulted in the establishment of several

towns. These armed encounters left trails of historical battle grounds, cemeteries and unmarked graves that are protected by the South African heritage legislation and must not be disturbed without consultation and approval from national and provincial heritage agencies. Graves in general, and historical (over 60 years) graves in particular, are of high social significance and must be preferably preserved *in situ*. Other historical mining activities relates to the discovery of chrome and platinum in the project area. All the same, archaeological resources are known to occur in buried contexts that may only be identifiable during prospecting, such that failure to detect them during field surveys is not absolute evidence of their absence and a clear procedure for reporting chance finds must be followed during prospecting.

This Archaeological and Heritage Impact Assessment (AIA/HIA) report has been prepared to address requirements of the National Heritage Resources Act, Act 25 of 1999, Section 38. Integrated Specialist Services (Pty) Ltd (ISS) was appointed by Mukhadakhomu Environmental Services (Pty) Ltd to conduct this Archaeological and Heritage Impact Assessment (AIA/HIA) Study for the proposed prospecting right application in Madibeng Local Municipality of North West Province. This report includes an impact study on potential archaeological and cultural heritage resources that may be associated with the proposed prospecting. This study was conducted as part of the specialist input for the Environmental authorisation process. The project information has been passed to ISS research team by the project EAP. Based on the findings of Pelser (2020) the study confirmed that archaeological sites, cultural heritage sites, burial grounds and isolated artefacts are present on the proposed prospecting site. Our field survey was conducted to confirm and map heritage sites located within the proposed prospecting site. The general project area is predominantly agriculture, residential and mining.

The report makes the following observations:

- The findings of this report have been informed by desktop data review, field survey and impact assessment reporting which include recommendations to guide heritage authorities in making decisions with regards to the proposed prospecting.
- The prospecting right site is relatively accessible, and the field survey was effective enough to cover most sections of the project receiving environs. However, visibility was largely compromised by dense vegetation cover which impeded the identification of surface archaeological remains.
- According to the prospecting plan, the 30 prospecting holes will be confined to a section of the site which is predominantly grazing area (see Figure 2).
- The village area will not be subject to prospecting which means that even the village cemetery will not be affected by the planned prospecting.
- Although they may be need for access roads, there are existing farm tracks which can be utilised during prospecting to reduce the impact of creating new access roads.

The report sets out the potential impacts of the proposed prospecting on heritage matters and recommends appropriate safeguard and mitigation measures that are designed to reduce the impacts where appropriate. The report makes the following recommendations:

- ❖ The prospecting teams must be inducted on the possibility of encountering archaeological resources that may be accidentally exposed during clearance and construction at the development site prior to commencement of work on the site in order to ensure appropriate mitigation measures and that course of action is afforded to any chance finds.
- ❖ If archaeological materials are uncovered, work must cease immediately and the SAHRA/ North West PHRA be notified, and activity should not resume until appropriate management provisions are in place.
- ❖ The findings of this report, with approval of the SAHRA, may be classified as accessible to any interested and affected parties within the limits of the legislations.
- ❖ No prospecting or blasting is allowed within 500m from burial site or building regardless of whether the building or structure is over 60 years.

This report concludes that the impacts of the proposed prospecting on the cultural environmental values are not likely to be significant on the entire development site if the EMP includes recommended safeguard and mitigation measures identified in this report.

The assessment reached the following conclusions:

1. The entire prospecting site has been previously used for agriculture including large cattle grazing paddocks, kraals and fence lines.

Recommendations

1. It is also advised that the Archaeology, Palaeontology and SAHRA Meteorites Unit is alerted when prospecting work begins.
2. Strict and clear reporting procedures for chance findings must be followed by the applicant and contractors throughout the whole period of prospecting.

ABBREVIATIONS

AIA	Archaeological Impact Assessment
ECO	Environmental Control Officer
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EM	Environmental Manager
EMP	Environmental Management Plan
HIA	Heritage Impact Assessment
LIA	Late Iron Age
NHRA	Nation Heritage Resources Act, Act 25 of 1999
PM	Project Manager
PHRA	Provincial Heritage Agency
SM	Site Manager
SAHRA	South African Heritage Resources Agency

KEY CONCEPTS AND TERMS

Periodization Archaeologists divide the different cultural epochs according to the dominant material finds for the different time periods. This periodization is usually region-specific, such that the same label can have different dates for different areas. This makes it important to clarify and declare the periodization of the area one is studying. These periods are nothing a little more than convenient time brackets because their terminal and commencement are not absolute and there are several instances of overlap. In the present study, relevant archaeological periods are given below;

Early Stone Age (~ 2.6 million to 250 000 years ago)

Middle Stone Age (~ 250 000 to 40-25 000 years ago)

Later Stone Age (~ 40-25 000, to recently, 100 years ago)

Early Iron Age (~ AD 200 to 1000)

Late Iron Age (~ AD1100-1840)

Historic (~ AD 1840 to 1950, but a Historic building is classified as over 60 years old)

Definitions Just like periodization, it is also critical to define key terms employed in this study. Most of these terms derive from South African heritage legislation and its ancillary laws, as well as international regulations and norms of best practice. The following aspects have a direct bearing on the investigation and the resulting report:

Cultural (heritage) resources are all non-physical and physical human-made occurrences, and natural features that are associated with human activity. These can be singular or in groups and include significant sites, structures, features, ecofacts and artefacts of importance associated with the history, architecture, or archaeology of human development.

Cultural significance is determined by means of aesthetic, historic, scientific, social, or spiritual values for past, present, or future generations.

Value is related to concepts such as worth, merit, attraction or appeal, concepts that are associated with the (current) usefulness and condition of a place or an object. Although significance and value are not mutually exclusive, in some cases the place may have a high level of significance but a lower level of value. Often, the evaluation of any feature is based on a combination or balance between the two.

Isolated finds are occurrences of artefacts or other remains that are not in-situ or are located apart from archaeological sites. Although these are noted and recorded, but do not usually constitute the core of an impact assessment, unless if they have intrinsic cultural significance and value.

In-situ refers to material culture and surrounding deposits in their original location and context, for example an archaeological site that has not been disturbed by farming.

Archaeological site/materials are remains or traces of human activity that 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. According to the National Heritage Resources Act (NHRA) (Act No. 25 of 1999), no archaeological artefact, assemblage, or settlement (site) and no historical building or structure older than 60 years may be altered, moved or destroyed without the necessary authorisation from the South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority.

Historic material are remains resulting from human activities, which are younger than 100 years, but no longer in use, including artefacts, human remains and artificial features and structures.

Chance finds means archaeological artefacts, features, structures or historical remains accidentally found during development.

A grave is a place of interment (variably referred to as burial) and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place. A grave may occur in isolation or in association with others where upon it is referred to as being situated in a cemetery (contemporary) or burial ground (historic).

A site is a distinct spatial cluster of artefacts, structures, organic and environmental remains, as residues of past human activity.

Heritage Impact **Assessment (HIA)** refers to the process of identifying, predicting, and assessing the potential positive and negative cultural, social, economic, and biophysical impacts of any proposed project, which requires authorisation of permission by law, and which may significantly affect the cultural and natural heritage resources. Accordingly, an HIA must include recommendations for appropriate mitigation measures for minimising or circumventing negative impacts, measures enhancing the positive aspects of the proposal and heritage management and monitoring measures.

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

Mitigation is the implementation of practical measures to reduce and circumvent adverse impacts or enhance beneficial impacts of an action.

Mining heritage sites refer to old, abandoned mining activities, underground or on the surface, which may date from the prehistorical, historical or the relatively recent past.

Study area or 'project area' refers to the area where the developer wants to focus its development activities (refer to plan).

Phase I studies refer to surveys using various sources of data and limited field walking in order to establish the presence of all possible types of heritage resources in any given area

.

1 INTRODUCTION

Background

Most heritage sites occur within communities, whose development should not be neglected in the name of heritage preservation but should be encouraged and embraced within legal and adaptive management frameworks (Carter and Grimwade 1997; Salafsky *et al* 2001). This case is true for the entire prospecting area, which hosts palaeontological, archaeological, historical, natural and contemporary heritage resources. Dikwena Minerals (Pty) Ltd is applying for a prospecting right on various portions of the farm Buffelsdraai 151 JQ within Madibeng Local Municipality in the North West Province. Previous heritage studies (Pelser 2020) recorded scatters of lithic tools within the proposed prospecting site. Heritage studies in the Assen area mention a range of heritage resources in the general project area. As such this current report must be read in conjunction with the initial HIA report by Pelser (2020). This study mainly focused on the impact zone where prospecting holes will be drilled which was initially not provided (see Figure 1).

The purpose of this Archaeology and Heritage Study is to assess presence/absence of heritage resources on the prospecting right site. The study was designed to ensure that any significant archaeological or cultural physical property or sites are located and recorded, and site significance is evaluated to assess the nature and extent of expected impacts from the proposed development. The assessment includes recommendations to manage the expected impact of the proposed prospecting. The report includes recommendations to guide heritage authorities in making appropriate decision with regards to the environmental approval process for the prospecting right application. The report concludes with detailed recommendations on heritage management associated with the proposed prospecting. Integrated Specialist Services (Pty) Ltd (ISS), an independent consulting firm, conducted an assessment; research and consultations required for the preparation of the archaeological and heritage impact report in accordance with its obligations set in the NHRA as well as the environmental management legislations.

In line with SAHRA guidelines, this report, not necessarily in that order, provides:

1) Management summary
2) Methodology
3) Information with reference to the desktop study
4) Map and relevant geodetic images and data
5) GPS co-ordinates
6) Directions to the site
7) Site description and interpretation of the cultural area where the project will take place
8) Management details, description of affected cultural environment, photographic records of the project area
9) Recommendations regarding the significance of the site and recommendations regarding further monitoring of the site.
10)Conclusion

Description of the proposed project

Dikwena Minerals (Pty) Ltd is undertaking a prospecting right application which will be valid for a period of approximately 5 years. The application is for both non-invasive and invasive methods of prospecting. and it entail the following activities but not limited to the activities below:

Non-Invasive methods are methods that do not cause disturbances to the land. Examples of non-invasive methods include aerial photography, desktop studies, and aeromagnetic surveys. Invasive methods are activities that result in land disturbances and comprise of diamond core drilling, sampling and sampling storage. The proposed activities will be implemented in phases as detailed below.

Non-invasive Activities (Phase 1)

Literature Review

Initial Phase 1 work will include the collection and interpretation of all available data and the compilation of Geographic Information Systems (GIS) database. The information to be collected will include aerial photos, orthophotos, aeromagnetic data, topo-cadastral maps, geological maps, results of historic exploration programmes and any other published literature and maps. The desktop study will aid in compiling a preliminary geological model of the area to be utilized in the planning geological mapping and sighting of drill holes.

Geophysical survey

Ground geophysical surveys will involve the systematic measurement of magnetic, gravitational and electromagnetic fields over target areas of interest within the property, using appropriate instruments. The individual survey areas will vary between 500 x 500m to 2 x 2km depending on the inferred size of any target. Magnetic survey lines will be spaced at a maximum of 50m apart and readings will be taken at a minimum of 5m intervals along the lines. Electromagnetic and gravity survey lines will be spaced at a maximum of 100m apart with readings taken at a maximum of 50m along the lines. After data collection has been completed, data processing and visualization will be carried out to allow the interpretation of the survey.

Resource estimation

The borehole, geophysical survey and analytical data/results are captured into an electronic database. A geological model is then developed that forms the basis for the resource estimate. The purpose of the resource estimate is to obtain an indication of the tonnage and quality of a potential base metal deposit.

Invasive Activities (Phase 2 & 3)

Drilling

Drilling will be the most important method of prospecting. Diamond core drilling method will be used. The rig will be mounted on a 4 x 4 truck or trailer. The hole diameter will be typically 47.5mm to 65mm. The mineralisation may be present from surface up to a depth of 1000m and thus drill holes depths will range between 200 and 1000m. An

independent and experienced drilling contractor will be used to complete the drilling in accordance with industry best practice and in compliance with the Mine Health and Safety Act. Borehole sites are GPS located and pegged. The site will be inspected and photographed prior to any disturbance. The removal of vegetation will be within the drill pad area and will be demarcated prior to construction, to ensure that the footprint of the disturbance is limited. Topsoil stripping will be restricted to the footprint of the site under operation as far as possible to minimise soil erosion. Where practicable topsoil will be stripped to a depth of 10cm and stockpiled separately. After each drill hole is complete, logged and sampled, the borehole collar is surveyed by an independent surveyor using a high-accuracy differential GPS. Thereafter the drill sumps will be filled in, the drill area rehabilitated and photographed according to the procedures as stipulated in the Environmental Management Plan. The rehabilitation process will be closely monitored to ensure that standards are not compromised. A drill site will only be considered rehabilitated when done in accordance with applicable legislation and acceptable environmental standards.

Sampling and Analyses/Test Work

The boreholes will be logged and sampled where mineralisation has been identified. Samples will be submitted for analyses to determine the average metal content. Each sample is logged, halved, bagged and numbered in the field by the geologist and field assistants. The core will be split into two halves, with one half of the core taken for assay purposes and the other half being retained. Each sample will be measured and weighed, and the sample lengths will be recorded before despatch for assays at a South African National Accreditation System (SANAS) accredited laboratory

The Construction phase

As this activity mainly entails Prospecting, a small drill pad will be set up on site, Enviro-loo ablution facilities placed in close proximity to it, drill site, access road, fuel storage and equipment storage will be located at an environmentally secure position/s agreed upon by the applicant, the landowner/s and the Environmental Control Officer (ECO) and cannot be determined at this stage of the process. No permanent structures will be erected. The

Prospecting (Operational) phase

In terms of this application, non-invasive prospecting activities would be carried out by the applicant within the prospecting study area once the right has been approved. The identified target areas shall be visited by means of 4x4 vehicles along existing farm access as far as practically possible. Dense/intact land parcels would be accessed by foot. During this phase, it is anticipated that there will be limited site clearance. The equipment which will be used is 4x4 vehicles in the initial phase. During the invasive drilling stage, a drilling rig will be used. The invasive prospecting phase of the project will involve the actual drilling, survey and sampling. Drilling and sampling will increase noise and can create dust. Employees operating the drilling and sampling equipment will use personal protective equipment (PPE) such as ear plugs to minimise exposure to the noise from machinery, dust masks, hard hats, safety boots, etc. Working hours (drilling and sampling) will be limited to between 07h00 and 17h30. A total of

approximately 30 holes will be drilled as part of Phase 2 and 3 respectively (thus per phase) to a depth of approximately 200m and 1000m respectively. All activities will be done in accordance with industry best practice and in compliance with the Mine Health and Safety Act

The Decommission/Rehabilitation phase

Decommissioning phase involve rehabilitation of the area to the state in which it was prior to prospecting and disturbance. All equipment will be removed from the site. All the stockpiled soil will be backfilled into the sumps and boreholes. Any rock cores and any ablution facilities that were erected will be removed.

During each of the above-mentioned phases all directly and indirectly impacted and affected parties will be consulted with before any activities take place.

Location of the proposed prospecting site

The proposed location for Dikwena Minerals (Pty) Ltd Chrome and Iron ore prospecting is o various portions of the farm Buffelsdraai 151 JQ: Portion RE, 3, 4, 5, 22 &; portion of portion 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17,18, 19, 20, 21, 23, 24, 25; 26; situated within Madibeng Local Municipality, North West Province (see Figure 1)

.

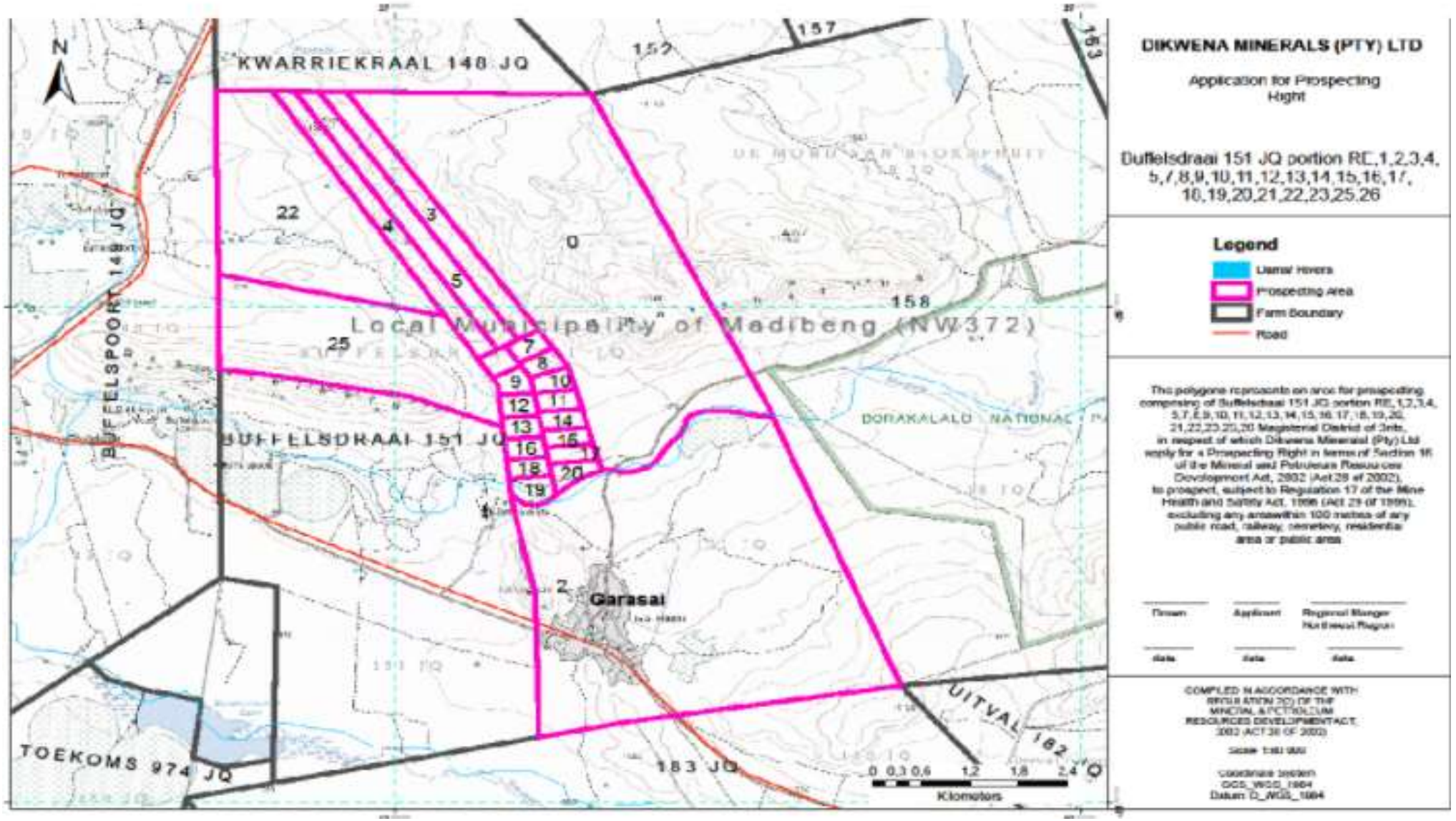

Figure 1: Proposed Prospecting Right Site (Dikwena,2021)

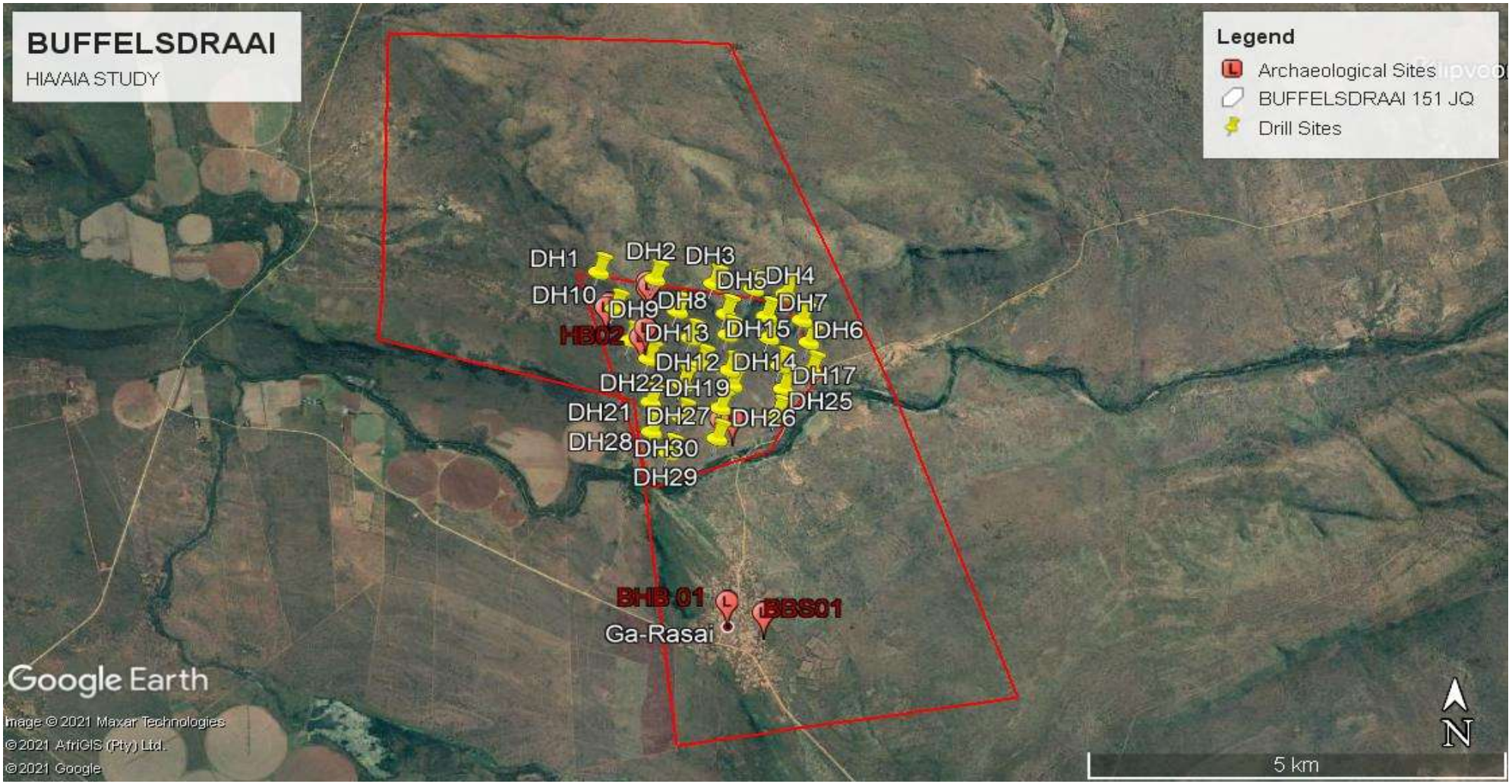

Figure 2: Prospecting Right Application site (ISS 2021)

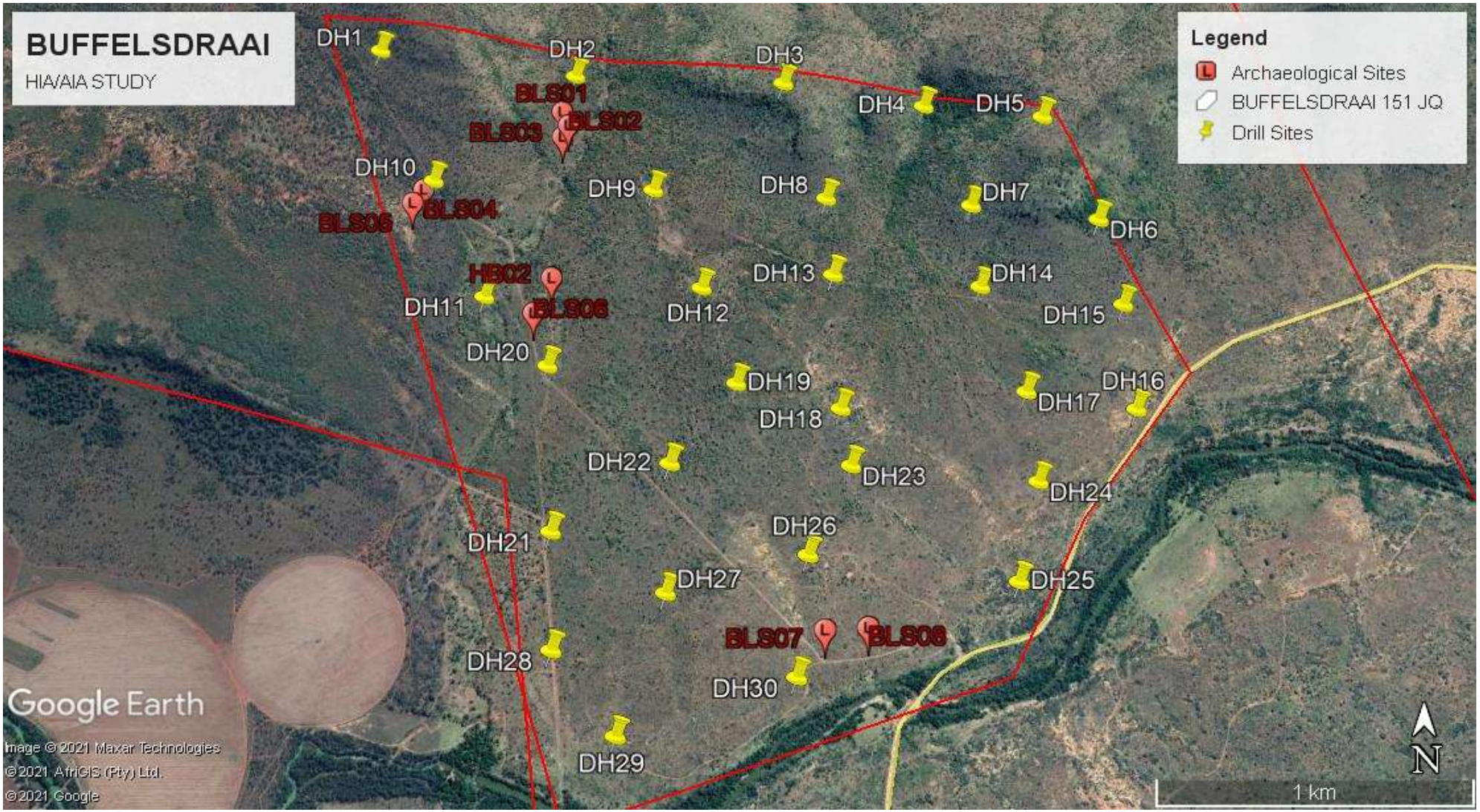

Figure 3: Drill Site on the Prospecting Right Application site (ISS 2021)

2 LEGAL REQUIREMENTS

Relevant pieces of legislations to the present study are presented here. Under the National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA), Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002), and the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and 2014 Regulations, an AIA or HIA is required as a specialist sub-section of the EIA.

Heritage management and conservation in South Africa is governed by the NHRA and falls under the overall jurisdiction of the SAHRA and its PHRAs. There are different sections of the NHRA that are relevant to this study. The proposed development is a listed activity in terms of Section 38 of the NHRA which stipulates that the following development categories require a HIA to be conducted by an independent heritage management consultant:

- Construction of a road, wall, **powerline**, pipeline, canal or other linear form of development or barrier exceeding 300m in length
- Construction of bridge or similar structure exceeding 50m in length
- Development or other activity that will change the character of a site -
  - Exceeding 5000 sq. m
  - Involving three or more existing erven or subdivisions
  - Involving three or more erven or divisions that have been consolidated within past five years
  - Rezoning of site exceeding 10 000 sq. m
  - The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- Any other development category, public open space, squares, parks, recreation grounds

Thus, any person undertaking any development in the above categories, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. Section 38 (2) (a) of the NHRA also requires the submission of a heritage impact assessment report for authorization purposes to the responsible heritage resources agencies (SAHRA/PHRAs).

Related to Section 38 of the NHRA are Sections 34, 35, 36 and 37. Section 34 stipulates that no person may alter, damage, destroy, relocate etc. any building or structure older than 60 years, without a permit issued by SAHRA or a provincial heritage resources authority. Section 35 (4) of the NHRA stipulates that no person may, without a permit issued by SAHRA, destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object. This section may apply to any significant archaeological sites that may be discovered before or during construction. This means that any chance find must be reported to SAHRA or PHRA

(the relevant PHRA), who will assist in investigating the extent and significance of the finds and inform about further actions. Such actions may entail the removal of material after documenting the find site or mapping of larger sections before destruction. Section 36 (3) of the NHRA also stipulates that no person may, without a permit issued by the SAHRA, destroy, damage, alter, exhume or remove from its original position or otherwise disturb any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority. This section may apply in case of the discovery of chance burials, which is unlikely. The procedure for reporting chance finds also applies to the likely discovery of burials or graves by the developer or his contractors. Section 37 of the NHRA deals with public monuments and memorials which exist in the proposed project area.

In addition, the new EIA Regulations (4 December 2014) promulgated in terms of NEMA (Act 107 of 1998) determine that any environmental reports will include cultural (heritage) issues. The new regulations in terms of Chapter 5 of the NEMA provide for an assessment of development impacts on the cultural (heritage) and social environment and for Specialist Studies in this regard. The end purpose of such a report is to alert the applicant (Dikwena Minerals (Pty) Ltd, the environmental consultant, SAHRA or PHRA and interested and affected parties about existing heritage resources that may be affected by the proposed development, and to recommend mitigatory measures aimed at reducing the risks of any adverse impacts on these heritage resources.

Assessing the Significance of Heritage Resources

The appropriate management of cultural heritage resources is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Cultural significance is defined in the Burra Charter as meaning aesthetic, historic, scientific, or social value for past, present, or future generations (Article 1.2). Social, religious, cultural, and public significance are currently identified as baseline elements of this assessment, and it is through the combination of these elements that the overall cultural heritage values of the site of interest, associated place or area are resolved.

Not all sites are equally significant and not all are worthy of equal consideration and management. The significance of a place is not fixed for all time, and what is considered of significance at the time of assessment may change as similar items are located, more research is undertaken, and community values change. This does not lessen the value of the heritage approach but enriches both the process and the long-term outcomes for future generations as the nature of what is conserved and why, also changes over time (Pearson and Sullivan 1995:7). This assessment of the Indigenous cultural heritage significance of the Site of Interest as its environments of the study area will be based on the views expressed by the traditional authority and community representatives, consulted documentary review and physical integrity.

African indigenous cultural heritage significance is not limited to items, places or landscapes associated with pre-European contact. Indigenous cultural heritage significance is understood to encompass more than ancient archaeological sites and deposits, broad landscapes, and environments. It also refers to sacred places and story sites, as well as historic sites, including mission sites, memorials, and contact sites. This can also refer to modern sites with particular resonance to the indigenous community. The site of interest considered in this project falls within this realm of broad significance.

Archaeological sites, as defined by the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people once lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities. Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and non-renewable. Many such sites are unfortunately lost on a daily basis through infrastructure developments such as powerlines, roads and other destructive economic activities such as mining and agriculture. This true for the Madibeng Local Municipality (proposed project area) whose main economic activities are mining and agriculture. It should be noted that once archaeological sites are destroyed, they cannot be replaced as site integrity and authenticity is permanently lost. Archaeological heritage contributes to our understanding of the history of the region and of our country and continent at large. By preserving links with our past, we may be able to appreciate the role past generations have played in the history of our country and the continent at large.

Categories of Significance

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

Aesthetic Value:

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

Historical Value:

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually, a place has historical value because of some kind of influence by an event, person, phase or activity.

Scientific Value:

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

Social Value:

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group. It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources, i.e. formally protected and generally protected sites:

Formally Protected Sites

- Grade 1 or national heritage sites, which are managed by SAHRA
- Grade 2 or provincial heritage sites, which are managed by the PHRA.
- Grade 3 or local heritage sites.

General Protection

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 70 years.
- Structures older than 60 years.

The certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally ranked into the following categories:

Significance Rating Action

No significance: sites that do not require mitigation.

Low significance: sites, which may require mitigation.

2a. Recording and documentation (Phase 1) of site; no further action required

2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction

Medium significance: sites, which require mitigation.

3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]

High significance: sites, where disturbance should be avoided.

4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism

High significance: Graves and burial places

4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six 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),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

An important aspect in assessing the significance and protection status of a heritage resource is often whether or not the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and mitigated in order to gain data /information, which would otherwise be lost.

Table 1: Evaluation of the proposed development as guided by the criteria in NHRA, MPRDA and NEMA

ACT	Stipulation for developments	Requirement details
NHRA Section 38	Construction of road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length	No
	Construction of bridge or similar structure exceeding 50m in length	No
	Development exceeding 5000 sq. m	Yes
	Development involving three or more existing erven or subdivisions	No
	Development involving three or more erven or divisions that have been consolidated within past five years	No
	Rezoning of site exceeding 10 000 sq. m	No
	Any other development category, public open space, squares, parks, recreation grounds	No
NHRA Section 34	Impacts on buildings and structures older than 60 years	No
NHRA Section 35	Impacts on archaeological and paleontological heritage resources	Subject to identification during Phase 1 walk down survey
NHRA Section 36	Impacts on graves	Subject to identification during Phase 1
NHRA Section 37	Impacts on public monuments	No
Chapter 5 (21/04/2006) NEMA	HIA is required as part of an EIA	Yes
Section 39(3)(b) (iii) of the MPRDA	AIA/HIA is required as part of an EIA	yes

Other relevant legislations

The Human Tissue Act

Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925 Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial Member of the Executive Committee (MEC) as well as the relevant Local Authorities.

Terms of Reference

The author was instructed to conduct an AIA/HIA study addressing SAHRA interim comments (CaseID: 15356) and the following issues:

- Archaeological and heritage potential of the proposed prospecting site including any known data on affected areas;
- Provide details on methods of study; potential and recommendations to guide the PHRA/ SAHRA to make an informed decision in respect of authorisation of the proposed development.
- Identify all objects, sites, occurrences and structures of an archaeological or historical nature (cultural heritage sites) located in and around the proposed prospecting site;
- Assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value;
- Describe the possible impact of the proposed prospecting on these cultural remains, according to a standard set of conventions;
- Propose suitable mitigation measures to minimize possible negative impacts on the cultural resources;
- Review applicable legislative requirements;

PHOTOGRAPHIC PRESENTATION OF THE PROSPECTING SITE

Plate 1: Photo 1: View of mountain range within the prospecting right site (Photograph © by Author 2021).

Plate 2: Photo 2: View of proposed prospecting right site (Photograph © by Author 2020).

Plate 3: Photo 3: View of prospecting right site (Photograph © by Author 2021).

Plate 4: Photo 4: Prospecting right is bound by gravel access road and electricity powerlines (Photograph © by Author 2021)

Plate 5: Photo 5: View of cattle grazing within the proposed prospecting right site (Photograph © by Author 2021)

Plate 6: Photo 6: View of stream cutting through proposed prospecting site (Photograph © by Author 2020). .

Plate 7: Photo 7: View of farm tracks cutting across the proposed prospecting site (Photograph © by Author 2021).

Plate 8: Photo 8: View of access roads within the proposed prospecting site (Photograph © by Author 2021).

Plate 9: Photo 9: View of prospecting right application site (Photograph © by Author 2021).

Plate 10: Photo 10: View of previously cleared road within the proposed prospecting site (Photograph © by Author 2020).

Plate 11 Photo 11: View of dwellings scattered across the proposed prospecting area (Photograph © by Author 2021).

Plate 12 Photo 12: View of proposed prospecting site (Photograph © by Author 2021). Note the high vegetative cover affects the visibility of archaeological materials.

Plate 13: Photo 13: View of proposed prospecting right site (Photograph © by Author 2020).

Plate 14: Photo 14: View of proposed prospecting site showing electricity distribution infrastructure and fence posts (Photograph © by Author 2021).

3 METHODOLOGY

Relevant published and unpublished sources were consulted in generating desktop information for this report. This included online databases such as the UNESCO website, Google Earth, Google Scholar and SAHRIS. Previous HIA in the project area were also consulted (van Schalkwyk 2014, Mlilo 2018, 2019, Pelser 2020). A number of published works on the archaeology, history and palaeontology were also consulted. This included dedicated archaeological, paleontological and geological works by (Breutz 1956; 1968; 1987; Button 1971; Clarck 1971; Eriksson *et al*. 1975; Bertrand and Eriksson 1977; Humphreys 1978; Humphreys and Thackeray 1983; Beaumont and Vogel 1984; Beaumont and Morris 1990; Beaumont 1999; Holmgren *et al*. 1999; Johnson *et al.* 1997; Peabody 1954; Shillington 1985; Wills 1992; Young 1934; 1940, Huffman 2007, Mason 1962). Thus, the prospecting right application by Dikwena Minerals (Pty) Ltd was considered in relation to the broader landscape, which is a key requirement of the ICOMOS Guidelines.

This document falls under the basic assessment phase of the HIA and therefore aims at providing an informed heritage-related opinion about the prospecting right application. This is usually achieved through a combination of a review of any existing literature and a basic site inspection. As part of the desktop study, published literature and cartographic data, as well as archival data on heritage legislation, the history and archaeology of the area were studied. The desktop study was followed by field surveys. The field assessment was conducted according to generally accepted HIA practices and aimed at locating all possible heritage objects, sites and features of cultural significance on the proposed prospecting site. Initially a drive-through was undertaken around the proposed development site as a way of acquiring the archaeological impression of the general area. This was then followed by a walk down survey in the study area, with a handheld Global Positioning System (GPS) for recording the location/position of each possible site. Detailed photographic recording was also undertaken where relevant. The findings were then analysed in view of the proposed prospecting in order to suggest further action. The result of this investigation is a report indicating the presence/absence of heritage resources and how to manage them in the context of the proposed prospecting. The field survey was undertaken on the 31st March and 1st of April of 2021 by two archaeologists and an assistant from the local village. The proposed prospecting site was surveyed through tracks, footpaths which cut across the proposed prospecting site. The main focus of the survey involved a pedestrian survey which was conducted across the section where prospecting holes will be located (see Figure 2&3). The pedestrian survey focussed on parts of the project area where it seemed as if disturbances may have occurred in the past, for example bald spots in the grass veld; stands of grass which are taller that the surrounding grass veld; the presence of exotic trees; evidence for building rubble, and ecological indicators such as invader weeds.

The literature survey suggests that prior to the 20th century modern agriculture and associated infrastructure; the general project area would have been a rewarding region to locate heritage resources related to Iron Age and historical sites (Bergh 1999: 4).

Assumptions and Limitations

The investigation has been influenced by the unpredictability of buried archaeological remains (absence of evidence does not mean evidence of absence) and the difficulty in establishing intangible heritage values. It should be noted that archaeological deposits (including graves and traces of archaeological heritage) usually occur below the ground level. Should artefacts or skeletal material be revealed at the site during prospecting, such activities should be halted immediately, and a competent heritage practitioner, SAHRA must be notified in order for an investigation and evaluation of the find(s) to take place (see NHRA (Act No. 25 of 1999), Section 36 (6). Recommendations contained in this document do not exempt the applicant from complying with any national, provincial and municipal legislation or other regulatory requirements, including any protection or management or general provision in terms of the NHRA. The author assumes no responsibility for compliance with conditions that may be required by SAHRA in terms of this report.

The field survey did not include any form of subsurface inspection beyond the inspection of burrows, road cut sections, and the sections exposed by erosion. Some assumptions were made as part of the study and therefore some limitations, uncertainties and gaps in information would apply. It should, however, be noted that these do not invalidate the findings of this study in any significant way:

- The proposed prospecting activities will be limited to specific right of site as detailed in the prospecting (Figure 2&3).
- The prospecting team to provide link and access to the proposed site by using the existing access roads and there will be no construction beyond the demarcated site.
- No excavations or sampling were undertaken, since a permit from heritage authorities is required to disturb a heritage resource. As such the results herein discussed are based on surficially observed indicators. However, these surface observations concentrated on exposed sections such as road cuts and clear farmland.
- This study did not include any ethnographic and oral historical studies, nor did it investigate the settlement history of the area.

Consultations

Public consultations are being conducted by the project EAP and issues raised by Interested and Affected parties will be presented during project specialist integration meetings. Issues relating to heritage will be forwarded to the

heritage specialist. Integrated Specialist Services (Pty) Ltd team consulted residents in respect of heritage resources such as graves, historical buildings and structures that may be located in the area. The study team also sought the assistance of local guide who is familiar with the prospecting site.

4 CULTURE HISTORY BACKGROUND OF THE PROJECT AREA

The Madibeng area is dominated by stone walled sites that date from the Late Iron Age (LIA), some of which were occupied into the historical period. These sites are associated with Tswana groups such as the Kgatla Kgafêla, the Tlhako, the Tlôkwa and Nguni-affiliated clans who were either living in the area from an early time, before the Sotho-Tswana arrived, or who were descended from Mzilikazi's Ndebele who temporarily occupied several settlement complexes in the area before they moved to the Zeerust-Marico area in AD1832. Descendants of these original Nguni-speaking people today live in Groenfontein, Rhenosterhoek and Kraalhoek. Several heritage surveys have been conducted and established the spatial distribution of stone walled sites across the Madibeng area. The focus of most of the research articles is on the distribution of stone walled sites across the region; settlement patterns, settlement features and settlement styles which can be distinguished. The research resulted in identifying a well and clearly defined Tswana settlement pattern which outlines the spatial composition of the Tswana village on a macro as well as on a micro level (Pistorius 1992, 1996). The pre-historical and historical background to the Madibeng area in the North-West Province of South Africa has been documented in a number of sources which range from oral historical accounts of the origins and settlement history of indigenous people such as Tswana groups who occupied the region from as early as AD1600 (Legassick 1969, 2010; Horn 1996; Manson 1996; Morton 2003, 2008; Bengha & Manson 2010); post-graduate studies which outline the origins and development of the town of Rustenburg (Pretorius 1967; Bergh 1992), and ethnographic accounts about the origins, settlement history, cultural life ways and material culture of Tswana groups who lived in the area during the last four centuries (McDonald 1940; Breutz 1953, 1987; Pauw 1960; Redelinghuys 1968).

Clusters of LIA stone walled sites occur along the lower slopes of mountains where dolerite was used in the construction of these sites. These clusters of sites are composed of varying numbers of individual sites (dikgôrô or imisi) that were grouped together to form villages which covered large surface areas. All these clusters are located along the lower contours or along the spurs of mountains such as Mogare, Mmatone, Patshwane and Mukukunupu on Tuschenkomst 135JP and Witkeifontein 136JP (Pistorius 1997a, 1997b, 1998). At least one remaining stone walled site was recorded near Assen Police Station.

Most of these stone walled sites are located on hill tops and foothills. The majority of these settlements are well preserved and clearly represent Sotho-Tswana sites which are referred to as dikgôrô (kgôrô, singular). These sites were occupied by a few related family groups (masikaMasika) under the leadership of an elderly male

(dikgosanaDikgosana). The common kgôrô comprised of an outer scalloped wall in which the dwellings for the family groups were constructed according to their social standing within the group (Harris 1963; Lye (ed.) 1975). The central part of the settlement housed the enclosures in which small and large stock such as cattle, goat and sheep were kept. An area in which the court (kgotla) was established also occurs near the centre of these villages and in close proximity of the dwelling complex of the ruler of the site. These settlements (dikgôrô) are usually clustered together and the number of individual sites in a cluster may vary. Clusters of dikgôrô cover large surface areas and in fact constitute small or large cultural landscapes (townscapes). Clusters of dikgôrô may constitute large villages known as metse (singular, motse) which falls under the supervision of a ruler (kgosi). Tswana sites are common on the mountain Patshwane, but also occur on Mmatone, Mogare, Mukukunupu and possibly Tlhorosane as well.

The following settlement types can be distinguished: Zulu or Ndebele villages (singular umuzi, plural imizi) were composed of oval outer walls that enclosed an inner set of structures consisting of several isolated or linked (cattle) enclosures and dwellings for the various ezigabeni (regiments) on opposite sides of centrally situated cattle enclosures, as well as an upper isigodlo area, where the village chief (induna) lived. Several of these Zulu (Ndebele) imizi were observed on the mountains of Mogare, Mmatone and Mukukunupu.

There are some sites that are composed of long terrace walls that are stepped down the slopes of mountains. The terrace walls are associated with a few small and large enclosures. These sites are not demarcated with clear outer boundary walls. It is possible that these sites, which also occur elsewhere in the Rustenburg and Brits areas, may have been built by Ndebele people. Sites were found that display a combination of Zulu (Ndebele) and Tswana features, such as Mogare, which has well-defined regimental quarters (ezigabeni). Such quarters are a characteristic feature of Zulu villages. These quarters occur in one half of the settlement and malapa, a Tswana feature, occur in the other half of the site. It seems as if sites with mixed Tswana and Zulu features also occur on Mmatone.

Large numbers of Late Iron Age communities established themselves in large village complexes near and on the slopes and spurs of mountains and kopjes such as Mogare, Mmatone, Patswane and Mukukunupu. Some sites are located at isolated hills such as Mabjaneng and Motsotsodi also occur in the area. These communities were all probably related to the pre-historical and historical Kgatla. These pre-historical and historical Iron Age farmers were followed by the first colonists during the second half of the 19th century. The Voortrekkers continued a mixed farming existence in the Madibeng area until the land was expropriated in order to be incorporated in the former Bophuthatswana homeland.

Historical context

Some of the earliest Voortrekkers who moved across the Magaliesberg in the early 19th century established themselves on the farms Kafferskraal and Witpensfontein (today Rustenburg) and Schaapkraal near Marikana. Since the second half of the 19th century, farmers and workers have occupied the Madibeng and Rustenburg District (including Mooinooi, Marikana and the Hartebeespoort Dam areas) (Berg 1992; De Beer 1976; Carruthers 2000; Erasmus 1975). Tobacco and citrus farming, together with cattle herding, became a subsistence pattern that has lasted to this day. Old farm homesteads, agricultural implements and other infrastructure such as tobacco drying sheds may still exist on farms adjacent to the study area. During the Anglo Transvaal War (1899-1902) British blockhouses were built along the ridge of the MagaliesburgMagaliesberg, from Pretoria in the east to Rustenburg in the west. Several of these structures are located in Kommandonek, Pampoennek and in Olifantsnek in the Magaliesberg. After the discovery of the Merensky Reef in 1929, the economy of the area was gradually changed from farming into platinum and chrome mining. What started as small scale mining activities north of the Magaliesberg during the 20th century was soon eclipsed by the rise of the platinum mining complex near Rustenburg. The discovery of the Merensky Reef The discovery of the Merensky Reef and the accompanying platinum boom was soon followed by the establishment of numerous chrome and norite mines in the North-West Province (Viljoen & Reimold 1999; Wagner 1973)

Early chrome mining

Carl Mauch's geological map of the project area indicated occurrence of chrome deposits close to the Hex River near Rustenburg, which he recorded in 1865. Chromite is also mentioned in official reports that were compiled by a certain Molengraaf. The first exploration for chrome occurred in 1917, and general production of the metal began in 1924, when 4 570 tons were mined. The deposits in the Complex can be divided into a Western Zone and an Eastern Zone. The deposits in the Western Zone stretch for approximately 200km from Brits to Rustenburg, further northwards to the west of the Pilanesberg, and from there, with some interruptions of seven to thirteen kilometres, to near the Crocodile River. The Eastern Complex starts near Draailkraal at the upper reaches of the Dwars River in the Lydenburg district. Further northwards the deposit crosses the Steelpoort River near the Steelpoort station and gradually turns north-westwards as far as Scheiding – a total distance of 120 kilometres. The Western Zone can be divided into four sections, namely a sector to the north of Rustenburg, two sectors to the west and to the north of the Pilanesberg, and a sector in the Brits-Rustenburg area. The sector to the west of the Pilanesberg seems to have been exploited the most. Here two distinct layers were distinguished, namely the Groenfontein layer and the Main Layer higher up in the sequence. These layers vary in thickness on farms such as Palmietfontein 208JP,

Groenfontein 138JP and Ruighoek 169JP. By the start of 1974, seventeen chrome mines were already operating: eight in the Western Zone, six in the Eastern Zone, two in Marico, and one near Mokopane. Some historical chrome mining activities occur on Rooderand 46JQ to the west of the Sedibelo Project Area.

Intangible Heritage

As defined in terms of the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (2003) intangible heritage includes oral traditions, knowledge and practices concerning nature, traditional craftsmanship and rituals and festive events, as well as the instruments, objects, artefacts and cultural spaces associated with group(s) of people. Thus, intangible heritage is better defined and understood by the particular group of people that uphold it. In the present study area, very little intangible heritage is anticipated on the development footprint because most historical knowledge does not suggest a relationship with the study area per se, even though several other places in the general area do have intangible heritage.

SAHRIS Database and Impact assessment reports in the proposed project area

Several AIA/HIA studies were conducted in the Madibeng area. The studies include powerline, substation and mining projects completed by Pistorius (2000, 2005, 2006a, 2006b, 2006c, 2009, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2013a, 2013b), van Sschalkwyk (2007, 2008, 2013, 2014), Pistorius, J.C.C. & Miller, S. (2011), Tomose (2015), Kusel (2005, 2006, 2008, 2011, 2012), Roodt, F (2005), Roodt, F& H (2006), Birkholtz (2007), Mlilo 2018, 2019) and Mlilo & Bandama 2016). The studies confirm the occurrence of stone walled Late Iron Age sites in the general Madibeng area. The recorded Late Iron Age site is the confirmation of the project area being an LIA cultural precinct. However, no sites were recorded, but the report mentions that structures older than 60 years occur in the area. The studies confirm the occurrence of several stone walled Late Iron Age sites in the Madibeng area. The recorded scatters of potsherds are a confirmation that the project area is a LIA cultural precinct. A search on the SAHRIS data base confirmed that several sites have been rescued or destroyed by mining, infrastructure developments and agriculture (Kusel 2012). The reports also mention the existence of structures older than 60 years and traditional burial sites in the project area, but none will be affected by the proposed mining development project

5 RESULTS OF THE ARCHAEOLOGICAL/HERITAGE ASSESSMENT STUDY

The main cause of impacts to archaeological sites is direct, physical disturbance of the archaeological remains themselves and their contexts. It is important to note that the heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose buried archaeological sites and artefacts, the artefacts are relatively meaningless once removed from their original position. The severe impacts are likely to occur during clearance, and drilling, indirect impacts may occur during movement of prospecting equipment. The excavation for foundations and fence line posts will result in the relocation or destruction of all existing surface heritage material such as potsherds. Similarly, the clearing of access roads will impact material that lies buried in the surface sand. Since heritage sites, including archaeological sites, are non-renewable, it is important that they are identified, and their significance assessed prior to construction. It is important to note, that due to the localised nature of archaeological resources, that individual archaeological sites could be missed during the survey, although the probability of this is very low within the prospecting right application site. Further, archaeological sites and unmarked graves may be buried beneath the surface and may only be exposed during prospecting. The purpose of this study is to assess the sensitivity of the area in terms of archaeology and to avoid or reduce the potential impacts of the proposed prospecting by means of mitigation measures (see appended Chance Find Procedure). The study concludes that the impacts will be negligible since prospecting activities will confined to a small section of the site and drilling holes will impact on a small portion of the land. The following section presents results of the field survey. The following section presents results of the archaeological and heritage survey conducted within the proposed development project site.

Table 1: **Geographical co-ordinates of the identified heritage resources**

Site	Coordinates	Brief Description	Comment relating to proposed development and Mitigation Measures
BLS1 Site	25°07'19.40"S 27°40'45.30"E	Scatter of LSA stone tools	Medium heritage significant
BLS2	25°07'21.00"S 27°40'46.10"E	Scatter of LSA stone tools	Medium heritage significance
BLS3	25°07'22.70"S 27°40'45.40"E	Scatter of LSA stone tools	Medium heritage significance
BLS4	25°07'28.80"S 27°40'28.60"E	Scatter of LSA stone tools	Medium heritage significance
BLS5	25°07'30.40"S 27°40'27.30"E	Scatter of LSA stone tools	Medium heritage significance
BLS6	25°07'43.40"S 27°40'42.40"E	Scatter of LSA stone tools	Medium heritage significance
BLS 7	25°08'18.45"S 27°41'17.11"E	Scatter of LSA stone tools	Medium heritage significance
BLS8	25°08'18.21"S 27°41'22.12"E	Scatter of LSA stone tools	Medium heritage significance
BBS 01	25°09'40.86"S 27°41'22.12"E	Village Cemetery	Medium to heritage significance. Site located out of the drill site
BHB 01	25°09'36.16"S 27°41'19.89"E	Community Church	Low heritage significance (age of church building not known). Site located out of the drill sites
BHB 02	25°07'39.25"S 27°40'44.51"E	windmill	Low significance (age of windmill not known)

Table 2: Drill sites affected by Heritage resources

Drill Sites	Archaeological site	Distance between Sites	Comment
DH 10	BLS 04	69.5m	May require monitoring
DH2	BLS 01	161.2m	Monitoring may not be required
DH20	BLS6	153.2m	Monitoring may not be required

Archaeological Sites

A total of 6 (six) sites were identified during the August 2020 assessment. All of these date to the Stone Age and contain from 1 single object to denser scatters of material. These sites are all Open-Air surface sites. Some of these were found close to the banks of one of the large streams that cut through the area, as well as erosion dongas. Although only six sites were found, it is very likely that there would be more sites scattered around the area, but

with the dense vegetation covering the area it was difficult to identify. The erosion dongas in the area was also not mapped in their totality and it is envisaged that more exposed material will be present here. The Stone Age material and tools identified and recorded is typical of the Middle to Later (MSA/LSA) Stone Age, although one possible Earlier Stone Age chopper was also found. The stone tools found include cores, flakes, possible scrapers and broken blades. Although the scatters of material found is not very dense it is believed that there are many more similar sites present in the study and application area. The significance of the sites is deemed to be of Medium to High significance from an archaeological point of view and worthy of further investigation and mitigation measures being implemented.

Other than sites recorded by Pelser (2020) the current study identified scatters of LSA stone tools which were exposed by erosion and clearance of access roads (see Plate 15 below). Most of the stone tools were not in their original positions, they were probably washed away by erosion from their original place. As such these scatters of tool lacked provenance. The scatters of lithic tools were recorded at GPS coordinates (25°08'08.42"S 27°41'17.40"E). Although visibility within the proposed prospecting site was seriously compromised by thick vegetation cover, the discoveries within the proposed prospecting site provides an insight of the potential of recovering more remains during clearance and prospecting. The affected landscape is heavily degraded from previous agriculture activities. This limited the chances of encountering significant *in situ* archaeological sites. It was assumed that there was always a very high chance of finding LIA archaeological sites within the proposed prospecting right application site. However, the chances of recovering significant archaeological materials were seriously compromised and limited due destructive land use activities such as agriculture.

Based on the field study results and field observations, it is the considered opinion of the author that the receiving environment for the proposed prospecting is low to medium potential to yield previously unidentified archaeological sites during prospecting work. Identified sites BLS 01, BLS04, BLS 06 are located near proposed drill sites, located within 60-250m from the drill sites DH 10, DH 20, DH 02(see Table 2 above). It is the considered opinion of the author that the identified scatters of lithic tools sites may not be directly affected by the proposed prospecting drilling given their relatively safe distance from drilling points.

Plate 15 Photo 15: The stone tools were found on gravel mounds from road works (Photograph © by Author 2021).

Plate 16: Photo 16: View of stone tools found (Photograph © by Author 2021).

Plate 17: Photo 17: View of LSA stone tools (Photograph © by Author 2020).

Buildings and Structures older than 60 years

The field study identified buildings and structures within the proposed drilling are of the prospecting right. Some of the building's age could not be confirmed, meanwhile some were deemed to be younger than 60 years and therefore do not trigger Section 34 of the NHRA. Note that buildings and structures older than 60 years regardless of their condition are protected by Section 34 of the NHRA.

Plate 18: Photo 18: View of windvane within the proposed project site (Photograph © by Author 2021).

Plate 19: Photo 19: View of structures found within the proposed development area (Photograph © by Author 2021).

Plate 20: Photo 20: An old church structure whose age could not be established (Photograph © by Author 2021). Note that this building is located at Ga Rasai Village where according to prospecting is not going to be affected.

Burial grounds and graves

Human remains and burials are commonly found close to archaeological sites; they may be found in abandoned and neglected burial sites or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials,

in most cases, are not marked at the surface. Archaeological and historical burials are usually identified when they are exposed through erosion and earth moving activities for infrastructure developments such as powerlines and roads. In some instances, packed stones or stones may indicate the presence of informal pre-colonial burials.

The field survey recorded one village cemetery located within the broader prospecting site but outside the section where the actual drilling will take place (see Figure 2&3). The village cemetery is located on GPS Coordinates 25°09'40.86"S 27°41'35.60"E (see Figure 1). The village cemetery will not be affected by the proposed prospecting according to the proposed prospecting plan (see Figure 2&3). The study noted that the possibility of encountering previously unidentified burial sites is low within the proposed prospecting site, should such sites be identified during prospecting, they are still protected by applicable legislations and they should be protected (also see Appendixes for more details). Burial sites older than 60 years are protected by the NHRA and those younger than 60 years are protected by the Human Tissue Act. Exhumation of graves must confirm to the standards set out in the ordinance on excavation (Ordinance no.12 of 1980 which replaced the old Transvaal Ordinance no.7 of 1925)

Plate 21: Photo 21: Showing the community cemetery (Photograph © by Author 2021).

Significance valuation for Burial Ground, Historic Cemeteries, and Individual Graves

The significance of burial grounds and gravesites is closely tied to their age and historical, cultural, and social context. Nonetheless, every burial should be considered as of high socio-cultural significance protected by practices, a series of legislations, and municipal ordinances.

Public Monuments and Memorials

The survey did not identify any historical monument and public memorials within the prospecting right application site. There are no monuments or plaques within the proposed prospecting site that are on the National Heritage or provincial list. However, it should be noted that there are Historical Monuments listed on SAHRIS Data base in the Madibeng Local Municipality of the North West Province. The proposed development will not impact on any listed monuments and memorials in the project area.

Battle fields

No known battles or skirmishes associated with the Anglo-Boer war and the struggle against apartheid were fought on the proposed prospecting site.

Palaeontology

The Palaeontological sensitivity map shows that the proposed project area is located within a generally sensitive area. The impacts of the proposed prospecting on palaeontology are medium to high (Durand 2021). The study site is underlain mostly by rock formations that have to date not yielded any fossils in North West Province. Dolomite which is demarcated as having a Very High Palaeontological Sensitivity due to the probability of finding stromatolites and the rare possibility of finding Plio-Pleistocene fossils occurs in the southwestern corner of the study site. Even though no distinct outcrops of stromatolites were found during the field assessment, there is a chance of exposing stromatolites during the clearing of the vegetation for prospecting purposes and for this reason a Chance Find Procedure has been included in the Recommendations (see appended report). If any fossil deposits are discovered during prospecting, the applicant/ contractor must alert SAHRA (South African Heritage Research Agency) immediately so that appropriate mitigation (e.g., Recording, sampling, or collection) can be taken by a professional palaeontologist.

Archaeo-Metallurgy, Prehistoric Mining and Mining Heritage

There are historical and current mining activities in the entire North West Province, however none are located on the proposed prospecting site.

Mitigation

The author recommends that care must be taken when approaching drill points DH2, DH10 &DH20 because they are located near scatters of lithic tools recorded during the survey. The area where medium density scatters of LSA. A professional archaeologist may be appointed to monitor during prospecting to ensure that appropriate mitigation measures (e.g., Recording, sampling, or collection) can be undertaken in the case accidental finds occurring during prospecting. This will ensure that any accidental finds are dealt with properly in accordance with NHRA. Prospecting teams must be inducted on how to identify heritage resources during prospecting and the reporting procedure in accordance with the appended Chance find procedure. A copy of the chance find procedure must be kept at the prospecting site for easy reference should accidental finds occur.

6 CUMMULATIVE IMPACTS

Cumulative impacts are defined as impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project. Therefore, the assessment of cumulative impacts for the proposed development is considered the total impact associated with the proposed development when combined with other past, present, and reasonably foreseeable future developments projects. An examination of the potential for other projects to contribute cumulatively to the impacts on heritage resources from this proposed development project was undertaken during the preparation of this report. The total impact arising from the proposed project (under the control of the applicant), other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures and trends which may be unregulated. The project's impact is therefore one part of the total cumulative impact on the environment. The analysis of a project's incremental impacts combined with the effects of other projects can often give a more accurate understanding of the likely results of the project's presence than just considering its impacts in isolation. The impacts of the proposed prospecting were assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in this case there are several infrastructure developments including agricultural activities where baselines have already been affected, the proposed prospecting will continue to add to the impacts in the region, it was deemed appropriate to consider the cumulative effects of proposed development.

This section considers the cumulative impacts that would result from the combination of the proposed development. There are existing infrastructure developments and agriculture activities within the proposed development sites. As such increased development in the project area will have a number of cumulative impacts on heritage resource whether known or covered in the ground. For example, during prospecting phase they will be increase in human activity and movement of heavy prospecting equipment and vehicles that could change, alter or destroy heritage

resources within and outside the proposed prospecting site given that archaeological remains occur on the surface. Cumulative impacts that could result from a combination of the proposed prospecting and other actual or proposed future developments in the broader study area include site clearance and the removal of topsoil could result in damage to or the destruction of heritage resources that have not previously been recorded for example abandoned and unmarked graves.

Heritage resources such as burial grounds and graves and archaeological as well as historical sites are common occurrences within the greater study area. These sites are often not visible and as a result, can be easily affected or lost. As such, prospecting workers may not see these resources, which results in increased risk of resource damage and/or loss. Vibrations and earth moving activities associated with drilling and excavation tower have the potential to crack/damage rock art covered surfaces, which are known to occur in the greater study area.

No specific paleontological resources were found in the project area during the time of this study; however, this does not preclude the fact that paleontological resources may exist within the greater study area. Sites of archaeological significance were identified, and cumulative effects are applicable. The nature and severity of the possible cumulative effects may differ from site to site depending on the characteristics of the sites and variables.

Cumulative impacts that need attention are related to the impacts of access roads and impacts to surface archaeological remains. Allowing the impact of the proposed prospecting to go beyond the surveyed area would result in a significant negative cumulative impact on sites outside the surveyed area. A significant cumulative impact that needs attention is related to stamping by especially prospecting vehicles during prospecting. Movement of heavy prospecting equipment must be monitored to ensure they do not drive beyond the approved sites. No significant cumulative impacts, over and above those already considered in the impact assessment, are foreseen at this stage of the assessment process. Cumulative impacts can be significant, if construction vehicles/equipment are not monitored to avoid driving through undetected heritage resources.

7 ASSESSMENT OF SIGNIFICANCE

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to the pipeline route under study for meeting a project need. The significance of the impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts will be determined through a synthesis of the criteria below:

Table 3: Criteria Used for Rating of Impacts

Nature of the impact (N)		
Positive	+	Impact will be beneficial to the environment (a benefit).
Negative	-	Impact will not be beneficial to the environment (a cost).
Neutral	0	Where a negative impact is offset by a positive impact, or mitigation measures, to have no overall effect.
`Magnitude(M)		
Minor	2	Negligible effects on biophysical or social functions / processes. Includes areas / environmental aspects which have already been altered significantly and have little to no conservation importance (negligible sensitivity*).
Low	4	Minimal effects on biophysical or social functions / processes. Includes areas / environmental aspects which have been largely modified, and / or have a low conservation importance (low sensitivity*).
Moderate	6	Notable effects on biophysical or social functions / processes. Includes areas / environmental aspects which have already been moderately modified and have a medium conservation importance (medium sensitivity*).
High	8	Considerable effects on biophysical or social functions / processes. Includes areas / environmental aspects which have been slightly modified and have a high conservation importance (high sensitivity*).
Very high	10	Severe effects on biophysical or social functions / processes. Includes areas / environmental aspects which have not previously been impacted upon and are pristine, thus of very high conservation importance (very high sensitivity*).
Extent (E)		
Site only	1	Effect limited to the site and its immediate surroundings.
Local	2	Effect limited to within 3-5 km of the site.
Regional	3	Activity will have an impact on a regional scale.
National	4	Activity will have an impact on a national scale.
International	5	Activity will have an impact on an international scale.
Duration (D)		
Immediate	1	Effect occurs periodically throughout the life of the activity.
Short term	2	Effect lasts for a period 0 to 5 years.
Medium term	3	Effect continues for a period between 5 and 15 years.
Long term	4	Effect will cease after the operational life of the activity either because of natural process or by human intervention.
Permanent	5	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability of occurrence (P)		
Improbable	1	Less than 30% chance of occurrence.
Low	2	Between 30 and 50% chance of occurrence.
Medium	3	Between 50 and 70% chance of occurrence.

High	4	Greater than 70% chance of occurrence.
Definite	5	Will occur, or where applicable has occurred, regardless or in spite of any mitigation measures.

Once the impact criteria have been ranked for each impact, the significance of the impacts will be calculated using the following formula:

Significance Points (SP) = (Magnitude + Duration + Extent) x Probability

The significance of the ecological impact is therefore calculated by multiplying the severity rating with the probability rating. The maximum value that can be reached through this impact evaluation process is 100 SP (points). The significance for each impact is rated as High (SP≥60), Medium (SP = 31-60) and Low (SP<30) significance as shown in the below.

Table 4: Criteria for Rating of Classified Impacts

Significance of predicted NEGATIVE impacts		
Low	0-30	Where the impact will have a relatively small effect on the environment and will require minimum or no mitigation and as such have a limited influence on the decision
Medium	31-60	Where the impact can have an influence on the environment and should be mitigated and as such could have an influence on the decision unless it is mitigated.
High	61-100	Where the impact will definitely have an influence on the environment and must be mitigated, where possible. This impact will influence the decision regardless of any possible mitigation.
Significance of predicted POSITIVE impacts		
Low	0-30	Where the impact will have a relatively small positive effect on the environment.
Medium	31-60	Where the positive impact will counteract an existing negative impact and result in an overall neutral effect on the environment.
High	61-100	Where the positive impact will improve the environment relative to baseline conditions.

Table 5: Operational Phase

Impacts and Mitigation measures relating to the proposed project during Prospecting Phase														
Activity/Aspect	**Impact /**	**Aspect**	**Nature**	**Magnitude**	**Extent**	**Duration**	**Probability**	**Significance before mitigation**	**Mitigation measures**	**Magnitude**	**Extent**	**Duration**	**Probability**	**Significance after mitigation**
Clearing and prospecting	Destruction of archaeological remains	Cultural heritage	-	6	1	4	5	55	• LSA site must be mapped and documented • A management plan for the site must be drawn • Section where scatters of potsherds were recorded must be avoided where possible • An archaeologist must be appointed to monitor during prospecting • Use chance find procedure to cater for accidental finds	6	2	4	3	36
	Disturbance of graves	Cultural heritage	-	2	1	1	1	4	• None required	2	1	1	1	4
	Disturbance of buildings and structures older than 60 years old	Cultural heritage	-	4	1	2	2	14	• None required	4	1	2	2	14
Movement of equipment	Destruction public monuments and plaques	Cultural heritage	-	2	1	1	1	4	• Mitigation is not required because there are no public monuments within the mining right application site	2	1	1	4	4
	Destruction of Palaeontological remains	Cultural heritage		6	1	4	5	55	• Mitigation required because the prospecting site fall within a medium to high palaentological sensitivity	6	2	4	3	36

Based on the results of the Impact Assessment Matrix the proposed development site is viable from a heritage perspective.

8 STATEMENT OF SIGNIFICANCE

Aesthetic Value

The aesthetic values of the AIA Study Area and the overall project area are contained in the valley bushveld environment and landscape typical of this part of the North West Province. The visual and physical relationship between AIA study area and the surrounding historical Cultural Landscape demonstrates the connection of place to the local and oral historical stories of the African communities who populated this region going back into prehistory.

The proposed development site will be situated within an environment and associated cultural landscape, which, although developed by existing settlements, remains representative of the original historical environment and cultural landscape of this part of North West Province. The local communities consider the project area a cultural landscape linked to their ancestors and history. However, the proposed development will not alter this aesthetic value in any radical way since it will add to the constantly changing and developing settlements.

Historic Value

The Indigenous historic values of the Site of Interest and overall study area are contained in the claim of possible historic homesteads being located on the affected area. The history of generations of the Sotho-Tswana clans is tied to this geographical region. Such history goes back to the pre-colonial period, through the colonial era, the colonial wars and subsequent colonial rule up to modern-day North-West Province.

Scientific value

Past settlements and associated roads and other auxiliary infrastructure developments and disturbance within the HIA Study Area associated with the Mining Right Application has resulted in limited intact landscape with the potential to retain intact large scale or highly significant open archaeological site deposits.

Social Value

The project sites fall within a larger and an extensive cultural landscape that is integrated with the wider inland. The overall area has social value for the local community, as is the case with any populated landscape. Literature review suggests that social value of the overall project area is also demonstrated through local history which associates the area with the coming of European missionaries, explorers and colonialists and the African struggle against settler colonialism in the second half of the 1800s and at the end of the 1800s, the colonial wars of resistance, the century long struggle for democracy that followed colonial subjugation. Several generations of communities originate from the project area and continue to call it home. As such, they have ancestral ties to the area. The land

also provides the canvas upon which daily socio-cultural activities are painted. All these factors put together confirms the social significance of the project area. However, this social significance is unlikely to be negatively impacted by the proposed development especially given the fact that the development will add value to the human settlements and activities already taking place. Some sections of development site are covered by thick bushes and vegetation retains social value as sources of important herbs and traditional medicines. As such, they must be considered as significant social value sites

9 DISCUSSION

Several archaeologists and researchers conducted various Phase 1 archaeological studies in the Madibeng area since 2000. The studies were conducted for various infrastructure developments such as powerlines and substations, pipelines and residential developments. These studies recorded stone walled sites which are characteristic of the LIA in the North West Region for example van Schalkwyk (2007 & 2009), Huffman (2007), Pistorius (2000, 2005, 2006, 2009, 2010, 2011, 2012, 2013), and Tomose (2015). The recorded LIA site falls within the context of several stone walled sites scattered in the region. Therefore, the current study should be read in conjunction with previous Phase 1 Impact Studies conducted in the general project area.

- That proposed prospecting site is located within a heavily degraded area and has reduced sensitivity for the presence of highly significant physical cultural site remains, be they archaeological, historical or burial sites, due to previous earth moving disturbances resulting from developments and other land uses in the project area.
- That the survey focused on sample sections that had high potential to yield possible archaeological sites. Due to the length of the proposed haul road and size of mine development site, it was impractical to cover every inch of the project area. As such, there is the possibility that low to medium archaeological sites exist in the project area whereas the sampled sections fell outside sections with potential distinct archaeological sites.
- Limited ground surface visibility on sections of all the proposed mine project area that were not cleared at the time of the study may have impended the detection of other physical cultural heritage site remains, or archaeological signatures immediately associated with the proposed prospecting. This factor is exacerbated by the fact that the study was limited to general survey without necessarily conducting any detailed inspection of specific locations that will be affected by the proposed prospection.

The absence of confirmable and significant archaeological cultural heritage site is not evidence in itself that such sites did not exist in the proposed prospecting site. It may be that, given the dense development in most sections

of the development site, if such sites existed before, changing earth-moving activities may have destroyed their evidence on the surface. Furthermore, some sections were not accessible due to thick vegetation cover. Significance of the sites of Interest is not limited to presence or absence of physical archaeological sites. The LIA site recorded at the starting point of the proposed haul road confirms the fact that the project area has several generations of human settlements. This discovery testifies to the significance of the project area as a cultural landscape of note, which has discernible links to local oral history and folk stories, environmental and ethnobotanical aesthetics, popular memories etc. associated with significance emanating from intangible heritage of the region.

10 RECOMMENDATIONS

The study did not find any permanent barriers to the proposed prospecting right application. It is the considered opinion of the author that the proposed prospecting may proceed from a heritage resources management perspective, provided that mitigation measures are implemented if and when required. The following recommendations are based on the results of the AIA/HIA research, cultural heritage background review, site inspection and assessment of significance.

- The area where scatters of lithic tools were recorded and mapped must be avoided during prospecting.
- Should it become necessary to prospect on the recorded sites (see Figure 1) a professional archaeologist must be appointed to monitor during prospecting.
- A walk down survey may be required if additional drilling points are required.
- The proposed prospecting may be approved to proceed as planned under observation that project work does not extend beyond the surveyed site.
- Should any unmarked burials be exposed during prospecting, potential custodians must be trekked, consulted and relevant rescue/ relocation permits must be obtained from SAHRA and or Department of Health before any grave relocation can take place.
- Should chance archaeological materials or human burial remains be exposed during subsurface construction work on any section of the proposed development laydown sites, work should cease on the affected area and the discovery must be reported to the heritage authorities immediately so that an investigation and evaluation of the finds can be made. The overriding objective, where remedial action is warranted, is to minimize disruption in construction scheduling while recovering archaeological and any affected cultural heritage data as stipulated by the NHRA regulations.
- Subject to the recommendations herein made and the implementation of the mitigation measures and adoption of the project EMP, there are no other significant cultural heritage resources barriers to the

proposed development. The Heritage authority may approve the proposed prospecting right application to proceed as planned with special commendations to implement the recommendations here in made.

- If during development, operational or closure phases of this project, any person employed by the applicant, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, work must cease at the site of the find and this person must report this find to their immediate supervisor, and through their supervisor to the site manager.
- The Site Manager must then make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area before informing ISS
- In the event that archaeological materials are unearthed, all prospecting activities within a radius of at least 25m of such indicator should cease and the area be demarcated by a danger tape. Accordingly, a professional archaeologist should be contacted immediately
- It is the responsibility of the applicant to protect the site from publicity (i.e., media) until a mutual agreement is reached.
- Noteworthy that any measures to cover up the suspected archaeological material or to collect any resources is illegal and punishable by law. In the same manner, no person may exhume or collect such remains, whether of recent origin or not, without the endorsement by SAHRA.
- Overall, impacts to heritage resources are not considered to be significant for the project receiving environment. It is thus concluded that the project may be cleared to proceed as planned subject to the Heritage Authority ensuring that detailed heritage monitoring procedures are included in the project EMP for the construction phase, include chance archaeological finds mitigation procedure in the project EMP (See Appendix 1).
- The chance finds process will be implemented when necessary, especially when archaeological/palaeontological materials and burials are encountered during subsurface construction activities.
- The findings of this report, with approval of the SAHRA, may be classified as accessible to any interested and affected parties within the limits of the laws.

11 CONCLUDING REMARKS

The literature review and field research confirmed that the project area is situated within a contemporary cultural landscape dotted with settlements with long local history. Field survey established that the prospecting right application site was previously disturbed by agriculture activities although it yielded significant scatters of lithic tools. In terms of the archaeology and heritage in respect of the proposed prospecting site, the area where scatters of stone tools were recorded and mapped (10% of the site) must be monitored by a professional archaeologist. Other than that, there are no obvious 'Fatal Flaws' or 'No-Go' areas. The recorded stone tools are an indication of the potential to encounter significant in situ Stone Age sites. As such prospecting must be monitored by a professional archaeologist. The potential for chance finds is rated medium to high and the applicant and contractors are advised to be diligent and observant during prospecting. The procedure for reporting chance finds has clearly been laid out. This report concludes that the proposed prospecting may be approved by SAHRA to proceed as planned subject to recommendations herein made and heritage monitoring plan being incorporated into the prospecting EMP (also see Appendices). The mitigation measures are informed by the results of the AIA/HIA study and principles of heritage management enshrined in the NHRA, Act 25 of 1999.

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APPENDIX 1: CHANCE FIND PROCEDURE FOR THE PROSPECTING RIGHT APPLICATION ON PORTIONS OF THE FARM BUFFELSDRAAI IN THE NORTH WEST PROVINCE.

April 2021

ACRONYMS

BGG	Burial Grounds and Graves
CFPs	Chance Find Procedures
ECO	Environmental Control Officer
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
SAHRA	South African Heritage Resources Authority
SAPS	South African Police Service
UNESCO	United Nations Educational, Scientific and Cultural Organisation

CHANCE FIND PROCEDURE

Introduction

An Archaeological Chance Find Procedure (CFP) is a tool for the protection of previously unidentified cultural heritage resources during construction and mining. The main purpose of a CFP is to raise awareness of all construction, mine workers and management on site regarding the potential for accidental discovery of cultural heritage resources and establish a procedure for the protection of these resources. Chance Finds are defined as potential cultural heritage (or paleontological) objects, features, or sites that are identified outside of or after Heritage Impact studies, normally as a result of construction monitoring. Chance Finds may be made by any member of the project team who may not necessarily be an archaeologist or even visitors. Appropriate application of a CFP on development projects has led to discovery of cultural heritage resources that were not identified during archaeological and heritage impact assessments. As such, it is considered to be a valuable instrument when properly implemented. For the CFP to be effective, the site manager must ensure that all personnel on the proposed mining development site understand the CFP and the importance of adhering to it if cultural heritage resources are encountered. In addition, training or induction on cultural heritage resources that might potentially be found on site should be provided. In short, the Chance find procedure details the necessary steps to be taken if any culturally significant artefacts are found during construction.

Definitions

In short, the term 'heritage resource' includes structures, archaeology, meteors, and public monuments as defined in the South African National Heritage Resources Act (Act No. 25 of 1999) (NHRA) Sections 34, 35, and 37. Procedures specific to burial grounds and graves (BGG) as defined under NHRA Section 36 will be discussed separately as this require the implementation of separate criteria for CFPs.

Background

The prospecting right application site is located on various portions of the farm Buffelsdraai 151 JQ in the North West Province, the development site is subject to heritage survey and assessment at planning stage in accordance with the NHRA. These surveys are based on surface indications alone and it is therefore possible that sites or significant archaeological remains can be missed during surveys because they occur beneath the surface. These are often accidentally exposed in the course of construction or any associated construction work and hence the need for a Chance Find Procedure to deal with accidental finds. In this case an extensive Archaeological Impact Assessment was completed by Pelser (2020) and Mlilo (2021) on the prospecting right application site. The AIA/HIA conducted was very comprehensive covering the entire site. The current studies (Pelser 2020 & Mlilo 2021)

recorded scatters of LSA stone tools which further documentation is required should the project proceed to mining right application.

Purpose

The purpose of this Chance Find Procedure is to ensure the protection of previously unrecorded heritage resources along the proposed project site. This Chance Find Procedure intends to provide the applicant and contractors with appropriate response in accordance with the NHRA and international best practice. The aim of this CFP is to avoid or reduce project risks that may occur as a result of accidental finds whilst considering international best practice. In addition, this document seeks to address the probability of archaeological remains finds and features becoming accidentally exposed during digging of foundations and movement of construction equipment. The proposed prospecting activities have the potential to cause severe impacts on significant tangible and intangible cultural heritage resources buried beneath the surface or concealed by tall grass cover. Integrated Specialist Services and Heritage Consultants developed this Chance Find Procedure to define the process which govern the management of Chance Finds during construction. This ensures that appropriate treatment of chance finds while also minimizing disruption of the construction schedule. It also enables compliance with the NHRA and all relevant regulations. Archaeological Chance Find Procedures are to promote preservation of archaeological remains while minimizing disruption of construction scheduling. It is recommended that due to the low to moderate archaeological potential of the project area, all site personnel and contractors be informed of the Archaeological Chance Find procedure and have access to a copy while on site. This document has been prepared to define the avoidance, minimization and mitigation measures necessary to ensure that negative impacts to known and unknown archaeological remains as a result of project activities and are prevented or where this is not possible, reduced to as low as reasonably practical during construction and mining.

Thus, this Chance Finds Procedure covers the actions to be taken from the discovering of a heritage site or item to its investigation and assessment by a professional archaeologist or other appropriately qualified person to its rescue or salvage.

CHANCE FIND PROCEDURE

General

The following procedure is to be executed in the event that archaeological material is discovered:

- All construction/clearance activities in the vicinity of the accidental find/feature/site must cease immediately to avoid further damage to the find site.

- Briefly note the type of archaeological materials you think you have encountered, and their location, including, if possible, the depth below surface of the find
- Report your discovery to your supervisor or if they are unavailable, report to the project ECO who will provide further instructions.
- If the supervisor is not available, notify the Environmental Control Officer immediately. The Environmental Control Officer will then report the find to the Site Manager who will promptly notify the project archaeologist and SAHRA.
- Delineate the discovered find/ feature/ site and provide 25m buffer zone from all sides of the find.
- Record the find GPS location, if able.
- All remains are to be stabilised *in situ.*
- Secure the area to prevent any damage or loss of removable objects.
- Photograph the exposed materials, preferably with a scale (a yellow plastic field binder will suffice).
- The project archaeologist will undertake the inspection process in accordance with all project health and safety protocols under direction of the Health and Safety Officer.

- **Finds rescue strategy**: All investigation of archaeological soils will be undertaken by hand, all finds, remains and samples will be kept and submitted to a Museum as required by the heritage legislation. In the event that any artefacts need to be conserved, the relevant permit will be sought from the SAHRA.
- An on-site office and finds storage area will be provided, allowing storage of any artefacts or other archaeological material recovered during the monitoring process.
- In the case of human remains, in addition to the above, the SAHRA Burial Ground Unit will be contacted and the guidelines for the treatment of human remains will be adhered to. If skeletal remains are identified, an archaeological will be available to examine the remains.
- The project archaeologist will complete a report on the findings as part of the permit application process.
- Once authorisation has been given by SAHRA, the Applicant will be informed when mining activities can resume.

Management of chance finds

Should the Heritage specialist conclude that the find is a heritage resource protected in terms of the NRHA (1999) Sections 34, 36, 37 and NHRA (1999) Regulations (Regulation 38, 39, 40), ISS will notify SAHRA and/or PHRA on behalf of the applicant. SAHRA/PHRA may require that a search and rescue exercise be conducted in terms of

NHRA Section 38, this may include rescue excavations, for which ISS will submit a rescue permit application having fulfilled all requirements of the permit application process.

In the event that human remains are accidently exposed, SAHRA Burial Ground Unit or ISS Heritage Specialist must immediately be notified of the discovery in order to take the required further steps:

a. Heritage Specialist to inspect, evaluate and document the exposed burial or skeletal remains and determine further action in consultation with the SAPS and Traditional authorities:

b. Heritage specialist will investigate the age of the accidental exposure in order to determine whether the find is a burial older than 60 years under the jurisdiction of SAHRA or that the exposed burial is younger than 60 years under the jurisdiction of the Department of Health in terms of the Human Tissue Act.

c. The local SAPS will be notified to inspect the accidental exposure in order to determine where the site is a scene of crime or not.

d. Having inspected and evaluated the accidental exposure of human remains, the project Archaeologist will then track and consult the potential descendants or custodians of the affected burial.

e. The project archaeologist will consult with the traditional authorities, local municipality, and SAPS to seek endorsement for the rescue of the remains. Consultation must be done in terms of NHRA (1999) Regulations 39, 40, 42.

f. Having obtained consent from affected families and stakeholders, the project archaeologist will then compile a Rescue Permit application and submit to SAHRA Burial Ground and Graves Unit.

g. As soon as the project archaeologist receives the rescue permit from SAHRA he will in collaboration with the company/contractor arrange for the relocation in terms of logistics and appointing of an experienced undertaker to conduct the relocation process.

h. The rescue process will be done under the supervision of the archaeologist, the site representative and affected family members. Retrieval of the remains shall be undertaken in such a manner as to reveal the stratigraphic and spatial relationship of the human skeletal remains with other archaeological features in the excavation (e.g., grave goods, hearths, burial pits, etc.). A catalogue and bagging system shall be utilised that will allow ready reassembly and relational analysis of all elements in a laboratory. The remains will not be touched with the naked hand; all Contractor personnel working on

the excavation must wear clean cotton or non-powdered latex gloves when handling remains in order to minimise contamination of the remains with modern human DNA. The project archaeologist will document the process from exhumation to reburial.

i. Having fulfilled the requirements of the rescue/burial permit, the project archaeologist will compile a mitigation report which details the whole process from discovery to relocation. The report will be submitted to SAHRA and to the company.

Note that the relocation process will be informed by SAHRA Regulations and the wishes of the descendants of the affected burial.

APPENDIX 2: TRACK LOGS OF HERITAGE SURVEY

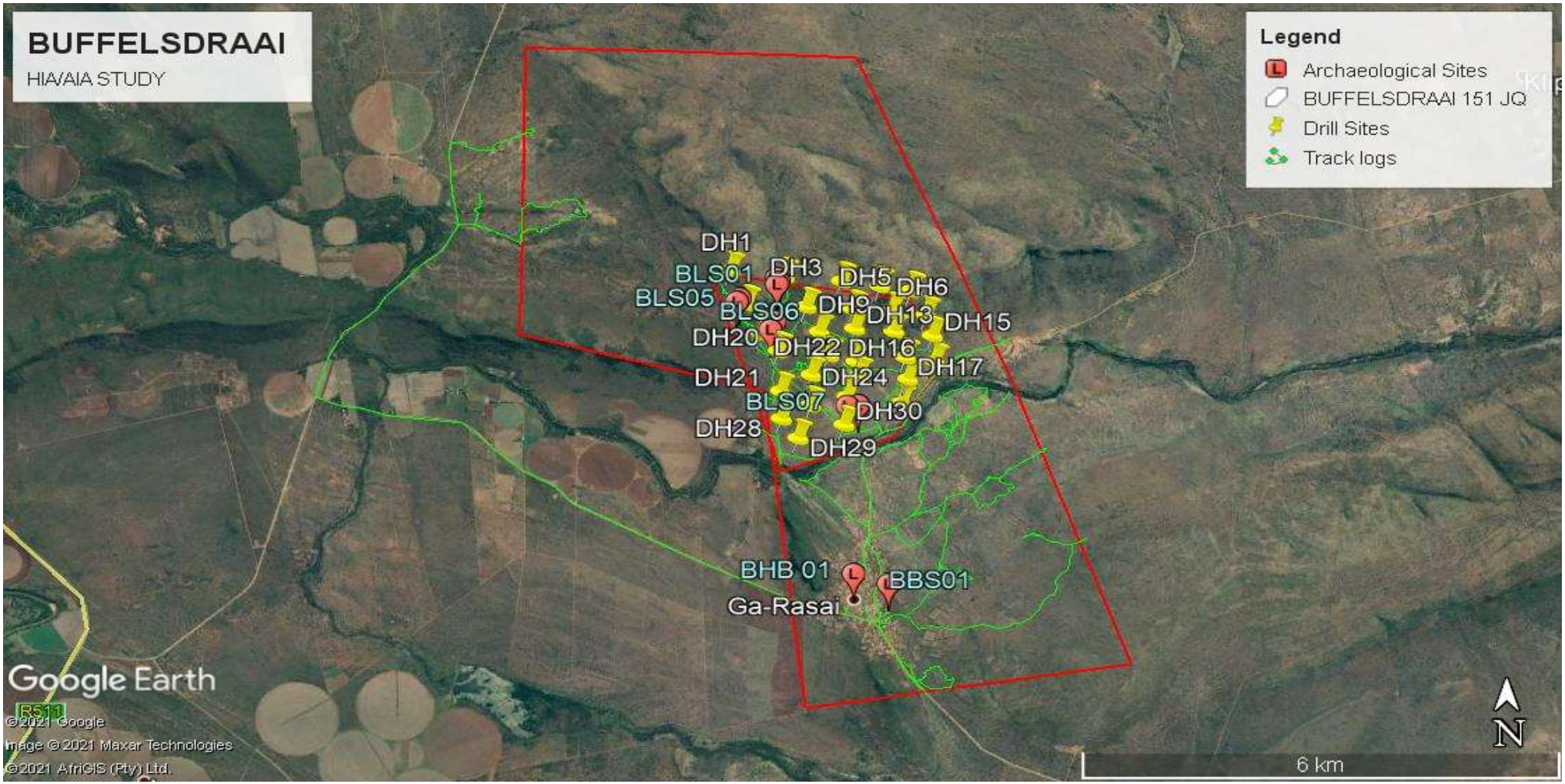

Figure 4 Showing track logs within the proposed prospecting right

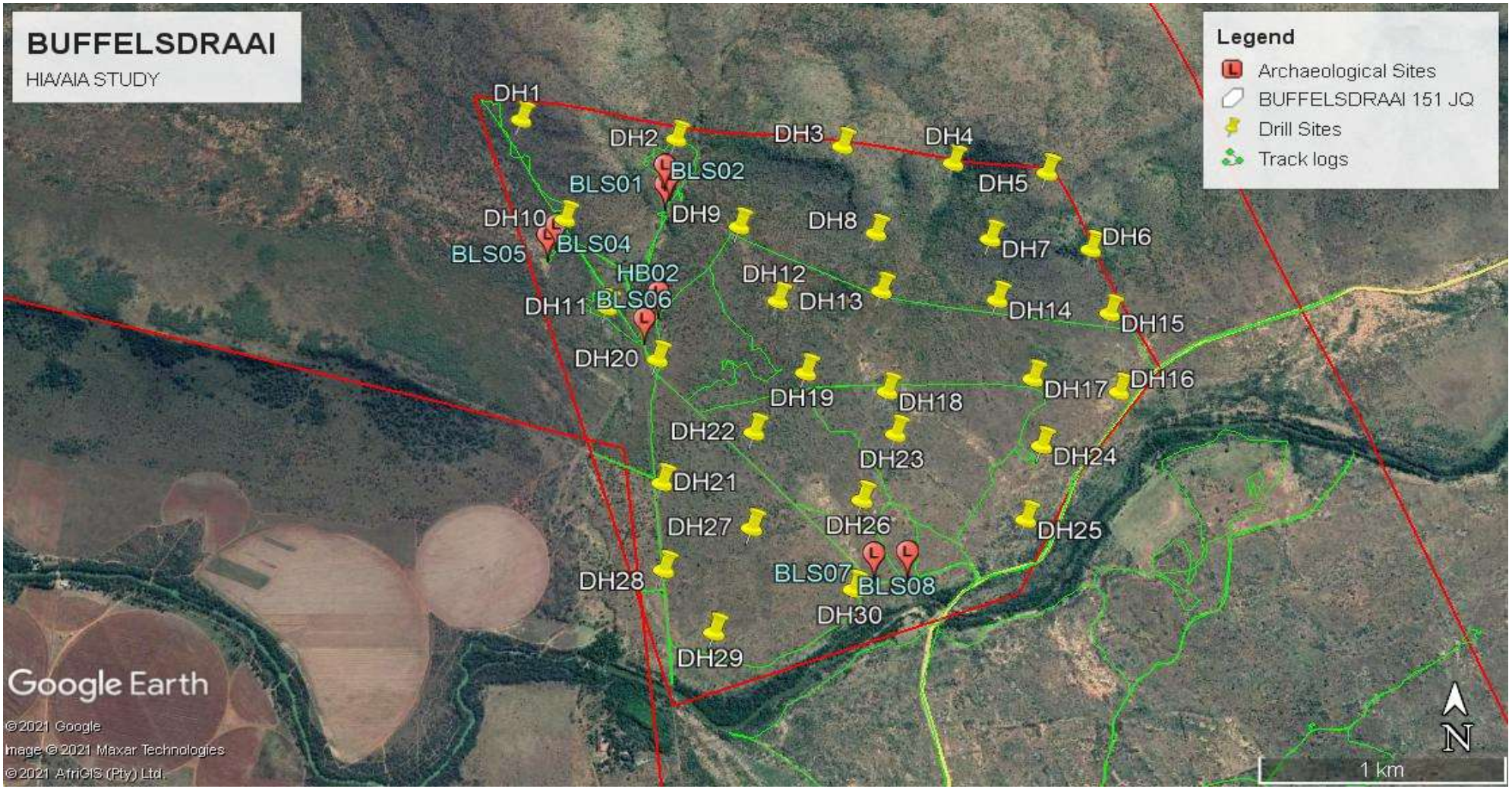

Figure 5: Showing Track logs within the proposed prospecting right

APPENDIX 3: HERITAGE MANAGEMENT PLAN INPUT INTO THE PROSPECTING RIGHT APPLICATION EMP

Objective	• Protection of archaeological sites and land considered to be of cultural value. • Protection of known physical cultural property sites against vandalism, destruction and theft; and • The preservation and appropriate management of new archaeological finds should these be discovered during construction.							
No.	Activity	Mitigation Measures	Duration	Frequency	Responsibility	Accountable	Contacted	Informed
Pre-Construction Phase								
1	Planning	Ensure all known sites of cultural, archaeological, and historical significance are demarcated on the site layout plan and marked as no-go areas.	Throughout Project	Weekly Inspection	Contractor [C] CECO	SM	ECO	EA EM PM
Prospecting Phase								
1	Emergency Response	Should any archaeological or physical cultural property heritage resources be exposed during excavation for the purpose of construction, construction in the vicinity of the finding must be stopped until heritage authority has cleared the development to continue.	N/A	Throughout	C CECO	SM	ECO	EA EM PM
		Should any archaeological, cultural property heritage resources be exposed during excavation or be found on development site, a registered heritage specialist or PHRA official must be called to site for inspection.		Throughout	C CECO	SM	ECO	EA EM PM
		Under no circumstances may any archaeological, historical or any physical cultural property heritage material be destroyed or removed form site;		Throughout	C CECO	SM	ECO	EA EM PM
		Should remains and/or artefacts be discovered on the development site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager who in turn will inform PHRA.		When necessary	C CECO	SM	ECO	EA EM PM
		Should any remains be found on site that is potentially human remains, the PHRA and South African Police Service should be contacted.		When necessary	C CECO	SM	ECO	EA EM PM
Rehabilitation Phase								
		Same as prospecting phase.						
Operational Phase								
		Same as prospecting phase.						

APPENDIX 4: HERITAGE MITIGATION MEASURES TABLE

SITE REF	HERITAGE ASPECT	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBLE PARTY	PENALTY	METHOD STATEMENT REQUIRED
Chance Archaeological and Burial Sites	General area where the proposed project is situated is a historic landscape, which may yield archaeological, cultural property, remains. There are possibilities of encountering unknown archaeological sites during subsurface construction work which may disturb previously unidentified chance finds.	Possible damage to previously unidentified archaeological and burial sites during construction phase. • Unanticipated impacts on archaeological sites where project actions inadvertently uncovered significant archaeological sites. • Loss of historic cultural landscape; • Destruction of burial sites and associated graves • Loss of aesthetic value due to construction work • Loss of sense of place Loss of intangible heritage value due to change in land use	In situations where unpredicted impacts occur construction activities must be stopped, and the heritage authority should be notified immediately. Where remedial action is warranted, minimize disruption in construction scheduling while recovering archaeological data. Where necessary, implement emergency measures to mitigate. • Where burial sites are accidentally disturbed during construction, the affected area should be demarcated as no-go zone by use of fencing during construction, and access thereto by the construction team must be denied. • Accidentally discovered burials in development context should be salvaged and rescued to safe sites as may be directed by relevant heritage authority. The heritage officer responsible should secure relevant heritage and health authorities permits for possible relocation of affected graves accidentally encountered during construction work.	• Contractor / • Project Manager • Archaeologist • Project EO	Fine and or imprisonment under the NHRA	Monitoring measures should be issued as instruction within the project EMP. PM/EO/Archaeologists Monitor construction work on sites where such development projects commence within the farm.

APPENDIX 5: LEGAL BACKGROUND IN SOUTH AFRICA

Extracts relevant to this report from the National Heritage Resources Act No. 25 of 1999, (Sections 5, 36 and 47):

General principles for heritage resources management

5. (1) All authorities, bodies and persons performing functions and exercising powers in terms of this Act for the management of heritage resources must recognise the following principles:

(a) Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and as they are valuable, finite, non-renewable and irreplaceable they must be carefully managed to ensure their survival;

(b) every generation has a moral responsibility to act as trustee of the national heritage for succeeding generations and the State has an obligation to manage heritage resources in the interests of all South Africans;

(c) heritage resources have the capacity to promote reconciliation, understanding and respect, and contribute to the development of a unifying South African identity; and

(d) heritage resources management must guard against the use of heritage for sectarian purposes or political gain.

(2) To ensure that heritage resources are effectively managed—

(a) the skills and capacities of persons and communities involved in heritage resources management must be developed; and

(b) provision must be made for the ongoing education and training of existing and new heritage resources management workers.

(3) Laws, procedures and administrative practices must—

(a) be clear and generally available to those affected thereby;

(b) in addition to serving as regulatory measures, also provide guidance and information to those affected thereby; and

(c) give further content to the fundamental rights set out in the Constitution.

(4) Heritage resources form an important part of the history and beliefs of communities and must be managed in a way that acknowledges the right of affected communities to be consulted and to participate in their management.

(5) Heritage resources contribute significantly to research, education and tourism and they must be developed and presented for these purposes in a way that ensures dignity and respect for cultural values.

(6) Policy, administrative practice and legislation must promote the integration of heritage resources conservation in urban and rural planning and social and economic development.

(7) The identification, assessment and management of the heritage resources of South Africa must—

(a) take account of all relevant cultural values and indigenous knowledge systems;

(b) take account of material or cultural heritage value and involve the least possible alteration or loss of it;

(c) promote the use and enjoyment of and access to heritage resources, in a way consistent with their cultural significance and conservation needs;

(d) contribute to social and economic development;

(e) safeguard the options of present and future generations; and

(f) be fully researched, documented and recorded.

Burial grounds and graves

36. (1) Where it is not the responsibility of any other authority, SAHRA must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit.

(2) SAHRA must identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with the grave referred to in subsection (1), and must maintain such memorials.

(3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources

authority.

(5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection (3)(b) unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority—

(a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and

(b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.

(6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority—

(a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and

(b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.

(7) (a) SAHRA must, over a period of five years from the commencement of this Act, submit to the Minister for his or her approval lists of graves and burial grounds of persons connected with the liberation struggle and who died in exile or as a result of the action of State security forces or agents provocateur and which, after a process of public consultation, it believes should be included among those protected under this section.

(b) The Minister must publish such lists as he or she approves in the Gazette.

(8) Subject to section 56(2), SAHRA has the power, with respect to the graves of victims of conflict outside the Republic, to perform any function of a provincial heritage resources authority in terms of this section.

(9) SAHRA must assist other State Departments in identifying graves in a foreign country of victims of conflict connected with the liberation struggle and, following negotiations with the next of kin, or relevant authorities, it may re-inter the remains of that person in a prominent place in the capital of the Republic.

General policy

47. (1) SAHRA and a provincial heritage resources authority—

(a) must, within three years after the commencement of this Act, adopt statements of general policy for the management of all heritage resources owned or controlled by it or vested in it; and

(b) may from time to time amend such statements so that they are adapted to changing circumstances or in accordance with increased knowledge; and

(c) must review any such statement within 10 years after its adoption.

(2) Each heritage resources authority must adopt for any place which is protected in terms of this Act and is owned or controlled by it or vested in it, a plan for the management of such place in accordance with the best environmental, heritage conservation, scientific and educational principles that can reasonably be applied taking into account the location, size and nature of the place and the resources of the authority concerned, and may from time to time review any such plan.

(3) A conservation management plan may at the discretion of the heritage resources authority concerned and for a period not exceeding 10 years, be operated either solely by the heritage resources authority or in conjunction with an environmental or tourism authority or under contractual arrangements, on such terms and conditions as the heritage resources authority may determine.

(4) Regulations by the heritage resources authority concerned must provide for a process whereby, prior to the adoption or amendment of any statement of general policy or any conservation management plan, the public and interested organisations are notified of the availability of a draft statement or plan for inspection, and comment is invited and considered by the heritage resources authority concerned.

(5) A heritage resources authority may not act in any manner inconsistent with any statement of general policy or conservation management plan.

(6) All current statements of general policy and conservation management plans adopted by a heritage resources authority must be available for public inspection on request.

APPENDIX 6: PALAEONTOLOGICAL REPORT

PALAEONTOLOGY IMPACT ASSESSMENT FOR THE PROPOSED PROSPECTING RIGHT APPLICATION ON THE FARM BUFFELSDRAAI 151 JQ, 50 KM NORTH OF BRITS, NORTHWEST PROVINCE

Compiled by: DR JF Durand (Sci.Nat.)

For:

Integrated Specialist Services (Pty) Ltd

Tel: +27 11 037 1565

Mobile: +27 71 685 9247

Email: trust.mlilo@gmail.com

Web: www.issolutions.co.za

4 April 2021

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1. EXECUTIVE SUMMARY

The study site is underlain mostly by rock formations that have to date not yielded any fossils in North West Province. Dolomite which is demarcated as having a Very High Palaeontological Sensitivity due to the probability of finding stromatolites and the rare possibility of finding Plio-Pleistocene fossils occurs in the southwestern corner of the study site. Even though no distinct outcrops of stromatolites were found during the field assessment, there is a chance of exposing stromatolites during the clearing of the vegetation for farming purposes and for this reason a Chance Find Procedure has been included in the Recommendations (p. 18-19).

Even though it is not essential to salvage every piece of stromatolite exposed because of its ubiquitous distribution in the dolomites of South Africa, it will be prudent not to destroy a major stromatolite find for scientific and heritage reasons.

Although the chances of finding an exceptional site that surpasses those already known to science are small, it remains important to alert the palaeontological community and SAHRA if a major fossil find is made in order to mitigate the impact on the fossil site.

2. INTRODUCTION

The Palaeontological Heritage of South Africa is unsurpassed and can only be described in superlatives. the South African Palaeontological record gives us insight in inter alia the origin of dinosaurs, mammals and humans. fossils are also used to identify rock strata and determine the geological context of the subregion with other continents and played a crucial role in the discovery of gondwanaland and the formulation of the theory of plate tectonics. Fossils are also used to study evolutionary relationships, sedimentary processes and palaeoenvironments.

Some of the oldest evidence of life on earth came from the rocks at Barberton which contain fossilized bacteria. Stromatolites in the dolomitic regions in South Africa were formed by shallow marine mats of Cyanobacteria. The Cyanobacteria, which were some of the first photosynthesising organisms, provided most of the oxygen in our atmosphere.

South Africa has the longest record of palaeontological endeavour in Africa. South Africa was even one of the first countries in the world in which museums displayed fossils and palaeontologists studied earth history. South African Palaeontological Institutions and their vast fossil collections are world-renowned and befittingly the South African heritage Act is one of the most sophisticated and best considered in the world.

Fossils and palaeontological sites are protected by law in South Africa. Construction and mining in fossiliferous areas may be mitigated in exceptional cases but there is a protocol to be followed.

This is a palaeontological impact assessment which was prepared in line with regulation 28 of the National Environmental Management Act (No. 107 of 1998) regulations on Environmental Impact Assessment. This involved an overview of the literature on the Palaeontology and Associated Geology of the area.

3. TERMS OF REFERENCE FOR THE REPORT

According to the South African Heritage Resources Act (Act 25 of 1999) (Republic of South Africa, 1999), certain clauses are relevant to palaeontological aspects for a terrain suitability assessment.

- **Subsection 35(4)** No person may, without a permit issued by the responsible heritage resources authority-
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.
- **Subsection 35(5)** When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may-
- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation form the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to

undertake the development if no application for a permit is received within two weeks of the order being served.

South Africa's unique and non-renewable palaeontological heritage is protected in terms of the NHRA. According to this act, heritage resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

As areas are developed and landscapes are modified, heritage resources, including palaeontological resources, are threatened. As such, both the environmental and heritage legislation require that development activities must be preceded by an assessment of the impact undertaken by qualified professionals. Palaeontological Impact Assessments (PIAs) are specialist reports that form part of the wider heritage component of:

- Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the National Heritage Resources Act, Act No. 25, 1999 by a heritage resources authority.
- Environmental Impact Assessment process as required in terms of other legislation listed in s. 38(8) of NHRA;
- Environmental Management Plans (EMPs) required by the Department of Mineral Resources.

HIAs are intended to ensure that all heritage resources are protected, and where it is not possible to preserve them in situ, appropriate mitigation measures are applied. An HIA is a comprehensive study that comprises a palaeontological, archaeological, built environment, living heritage, etc specialist studies. Palaeontologists must acknowledge this and ensure that they collaborate with other heritage practitioners. Where palaeontologists are engaged for the entire HIA, they must refer heritage components for which they do not have expertise on to appropriate specialists. Where they are engaged specifically for the palaeontology, they must draw the attention of environmental consultants and developers to the need for assessment of other aspects of heritage. In this sense, Palaeontological Impact Assessments that are part of Heritage Impact Assessments are similar to specialist reports that form part of the EIA reports.

The standards and procedures discussed here are therefore meant to guide the conduct of PIAs and specialists undertaking such studies must adhere to them.

The process of assessment for the palaeontological (PIA) specialist components of heritage impact assessments, involves:

Scoping stage in line with regulation 28 of the National Environmental Management Act (No. 107 of 1998) Regulations on Environmental Impact Assessment. This involves an **initial assessment** where the specialist evaluates the scope of the project (based, for example, on NID/BIDs) and advises on the form and extent of the assessment process. At this stage the palaeontologist may also decide to compile a **Letter of Recommendation for Exemption from further Palaeontological Studies**. This letter will state that there is little or no likelihood that any significant fossil resources will be impacted by the development. This letter should present a reasoned case for exemption, supported by consultation of the relevant geological maps and key literature.

A **Palaeontological Desktop Study** – the palaeontologist will investigate available resources (geological maps, scientific literature, previous impact assessment reports, institutional fossil collections, satellite images or aerial photos , etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area. A Desktop studies will conclude whether a further field assessment is warranted or not. Where further studies are required, the desktop study would normally be an integral part of a field assessment of relevant palaeontological resources.

A **Phase 1 Palaeontological Impact Assessment** is generally warranted where rock units of high palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large-scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed project area is unknown. In the recommendations of Phase 1, the specialist will inform whether further monitoring and mitigation are necessary. The Phase 1 should identify the rock units and significant fossil heritage resources present, or by inference likely to be present, within the study area, assess the palaeontological significance of these rock units, fossil sites or other fossil heritage, comment on the impact of the development on palaeontological heritage resources and make recommendations for their mitigation or conservation, or for any further specialist studies that are required in order to adequately assess the nature, distribution and conservation value of palaeontological resources within the study area.

A **Phase 2 Palaeontological Mitigation** involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or the recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction 1mphase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before Phase 2 may be implemented.

A **'Phase 3' Palaeontological Site Conservation and Management Plan** may be required in cases where the site is so important that development will not be allowed, or where development is to co-exist with the resource. Developers may be required to enhance the value of the sites retained on their properties with appropriate interpretive material or displays as a way of promoting access of such resources to the public.

The assessment reports will be assessed by the relevant heritage resources authority, and depending on which piece of legislation triggered the study, a response will be given in the form of a Review Comment or Record of Decision (ROD). In the case of PIAs that are part of EIAs or EMPs, the heritage resources authority will issue a comment or a record of decision that may be forwarded to the consultant or developer, relevant government department or heritage practitioner and where feasible to all three

4.DETAILS OF STUDY AREA AND THE TYPE OF ASSESSMENT:

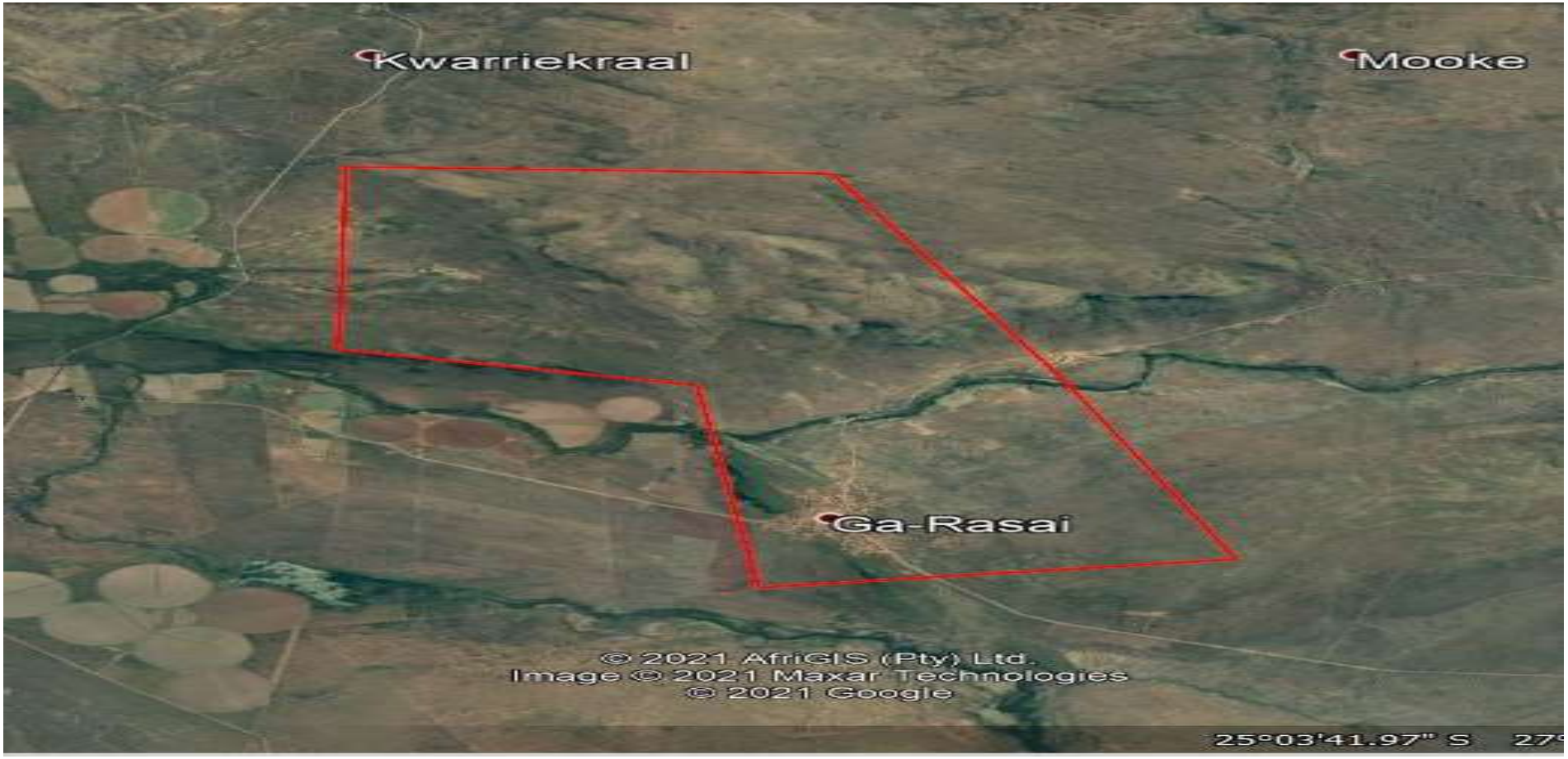


Figure 6: Google Earth photo indicating the study site (red polygon)

The site was visited and the relevant literature and geological maps for the region in which the development is proposed to take place, have been studied for a Palaeontological Impact Assessment. This region is mountainous, and the valleys in the area are mostly used for farming and residences. The areas not used for farming is covered by natural bushveld vegetation.

5 GEOLOGICAL SETTING OF THE STUDY AREA

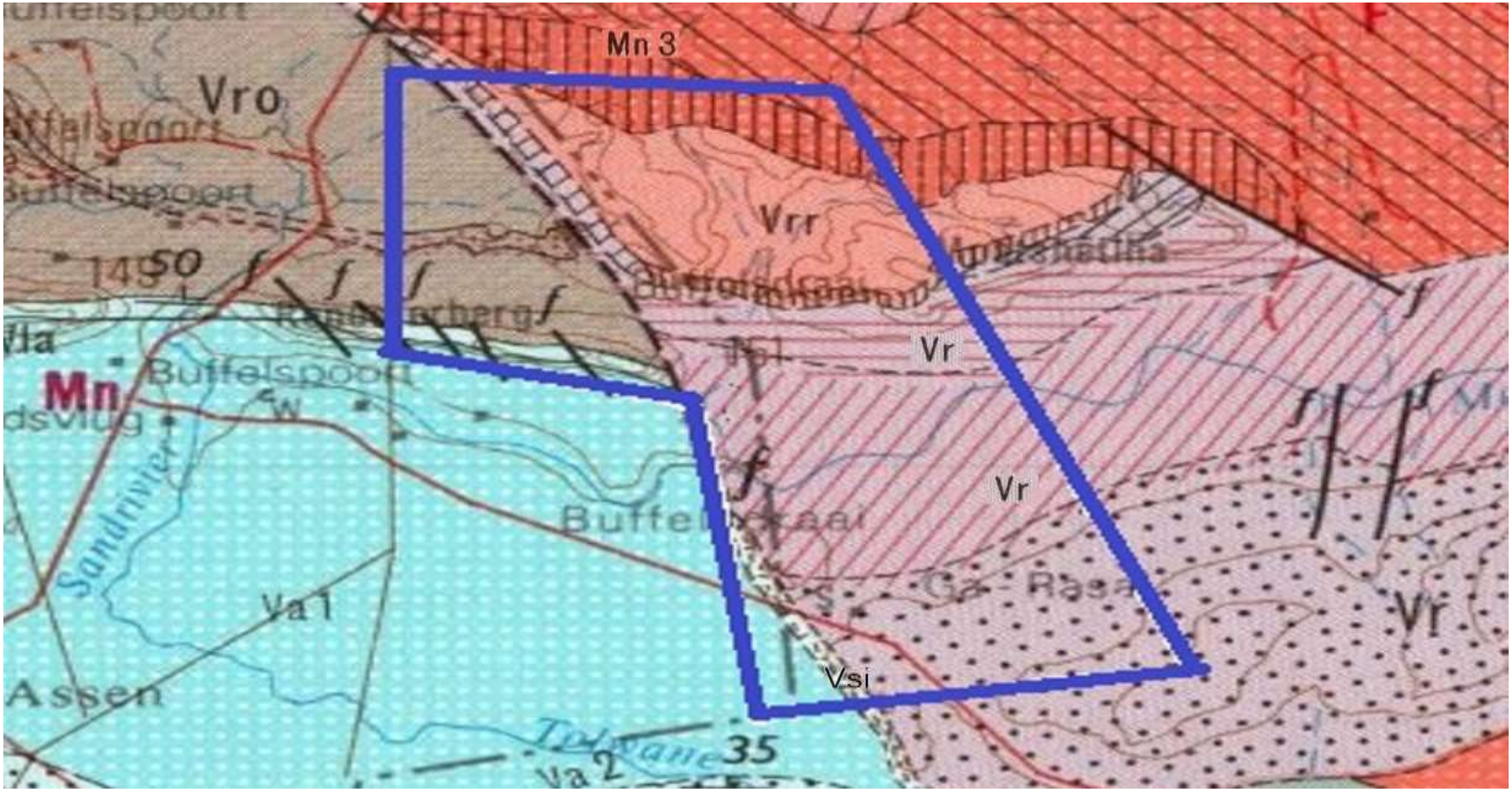
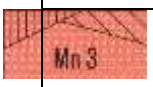
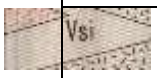
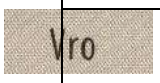
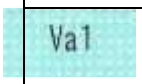
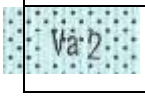


Figure 7: Geological Map of the study area and surroundings (adapted from the 2526 Rustenburg 1:250 000 Geology Map, Geological Survey, 1991). The blue polygon indicates the study site

Table 6: Geological Legend of the study area

	Lithology	Stratigraphy			Age
	Course-grained porphyritic granite, mineralised \\\\\, chilled margin IIIIII	Nebo Granite of the Lebowa Granite Suite of the Bushveld Igneous Complex			Mokolian
	Acid lava, agglomerate	Rooiberg Group		Transvaal Supergroup	Vaalian
	Quartzite, shale	Rayton Formation	Pretoria Group		
	Slate, shale, horfels, graphitic	Silverton Formation			
	Shale	Rooisloot Formation			
	Dolomite	Assen Formation, Chuniespoort Group			
	Quartzite, shale				

The southwestern corner of the study site is underlain by dolomites of the Malmani Subgroup. This subgroup is subdivided into five formations based on the chert content, stromatolite structure, intercalated shales, erosion surfaces and colour of the dolomite (Eriksson *et al*., 2009). The Malmani Subgroup which follows on the Black Reef Formation is in places up to 2000 m thick and forms a substantial part of the geology of the North West Province.

The Oaktree Formation which forms the oldest unit of the Malmani Subgroup consists of 10-200 m of carbonaceous shales, stromatolitic dolomites and quartzites.
The following Monte Christo Formation is a 300-500 m thick sedimentary unit which consists of erosive breccia and stromatolitic and oolitic platformal dolomites. The Lyttelton Formation which follows the Monte Christo Formation consists of a 100-200 m thick sequence of shales, quartzites and stromatolitic dolomites. This formation is covered by the up to 600m chert-rich Eccles Formation which also contains a series of erosion breccias which seperates it from the upper up to 400 m thick unit of the Malmani Subgroup – the Frisco Formation - which is characterised by its stromatolitic dolomites which becomes shale-rich towards the top of this unit (Eriksson *et al*., 2009).

The Pretoria Group is a 6-7km thick succession of mostly mudrocks alternating with quartzitic sandstones, basaltic-andesite lavas, subordinate conglomerates diamicites and carbonate rocks (Eriksson *et al*., 2009).

The study site is situated on the rim of the Bushveld Igneous Complex that is represented in the study area by the Nebo Granite of the Lebowa Granite Suite (Fig.2). The Bushveld Igneous Complex intruded into the older Transvaal Sequence approximately 2.1 Ga ago. This caused the argillaceous and arenaceous elements of the Transvaal Group rocks to be mineralised into metagreywacke, metaquartzite, hornfels, leptite and granulite (Cawthorn et al., 2009).

6. SITE VISIT

Figure 8: Facing north from 25°09'35.69"S 27°40'75.33"E

Figure 9: Facing south from 25°09'49.59"S 27°40'57.89"E

Figure 10: Quartzite exposed at 25°10'18.70"S 27°41'01.64"E

7. PALAEONTOLOGICAL POTENTIAL OF STUDY SITE

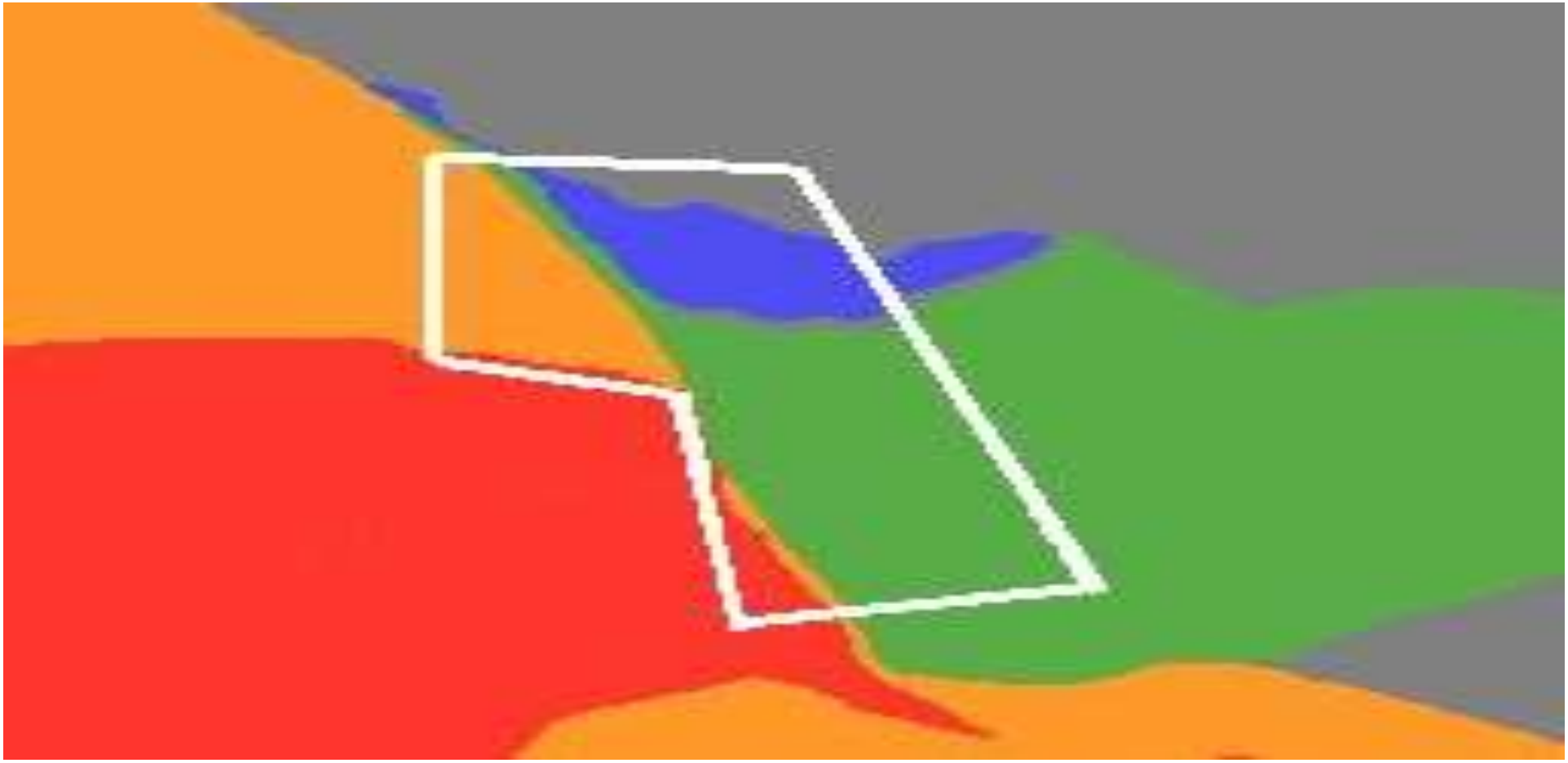


Figure 11:Palaeosensitivity of the study site (white polygon) (SAHRA, 2021)

Table 7:Palaeosenstivity Legend of the study site

COLOUR	PALAEONTOLOGICAL SIGNIFICANCE	ACTION
RED	VERY HIGH	Field assessment and protocol for finds are required.
ORANGE	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely.
GREEN	MODERATE	Desktop study is required.
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required.
GREY	INSIGNIFICANT / ZERO	No palaeontological studies are required.

The study site is situated in an area that is considered to vary from Very High, to High, to Moderate, to Low to Insignificant Palaeontological Sensitivity (Fig. 6). No fossils were found during the site visit.

The granite of the Nebo Granite of the Lebowa Granite Suite of the Bushveld Igneous Complex that occurs in the northern part of the study area in non-fossiliferous.

The rocks of the Rooiberg Group of the Transvaal Supergroup consist of acid lava and metamorphosed agglomerate. No fossils have been recorded from these rocks that are considered to have a Low Palaeontological Sensitivity (Groenewald & Groenewald, 2014).

The quartzite and shales of the Rayton Formation of the Pretoria Group of the Transvaal Supergroup underlies most of the southern half of the study site. Although no fossils have been recorded from these rocks, they are considered to have a Moderate Palaeontological Sensitivity (Groenewald & Groenewald, 2014).

The slate, shale and hornfels with minor carbonates of the Silverton Formation of the Pretoria Group of the Transvaal Supergroup occurs as a thin sliver between the Rayton Formation and the dolomite of the Malmani Group. These rocks are considered to have a High Palaeontological Sensitivity and may contain stromatolites.

The shale of the Rooisloot Formation of the Pretoria Group of the Transvaal Supergroup occurs in the north western part of the study site. Although it is considered to be of High Palaeontological Sensitivity no fossils have been recorded from this formation (Groenewald & Groenewald, 2014)

Dolomite of the Assen Formation of the Chuniespoort Group of the Transvaal Supergroup occurs in the southwestern corner of the study site. This formation is considered to be of Very High Palaeontological Sensitivity because of the probability of the occurrence of stromatolites and the rare instance of fossils associated with Plio-Pleistocene cave fills (Groenewald & Groenewald, 2014).

The underlying geology of the study site is mostly obscured by red soil and natural vegetation (see Figs. 3-5).

From an evolutionary, environmental, ecological and geological perspective stromatolites are very important. Stromatolites were formed approximately 2.2 Ga ago when mats of cyanobacteria covered the sea floor up to a certain depth which allowed them to photosynthesize. The slimy surface caused fine-grained mud and precipitates to adhere to them after which cyanobacterial strands consisting of chains of bacterial cells would continue to extend by means through the sediment in order to get enough light to photosynthesize. Very thin layers of sediments were set down during this process. In time these sedimentary layers were petrified and turned into columns of rock. Some of these columns which are stacked closely together are as thin as pencils, while others are formed mushroom-like scallops (see Figs. 7 - 9) and others formed bigger domes and even megadomes which are meters across.

Figure 12:Stromatolites at Sterkfontein Caves

These bacteria were amongst the first photosynthesizing organisms and it is thought that the chloroplast found in plants has evolved from a cyanobacterial ancestor. Cyanobacteria released oxygen as a by-product of photosynthesis in such quantities that it irrevocably changed the atmosphere from a reducing to an oxidizing atmosphere which had a devastating effect to most bacteria which were and still are anoxic. On the other hand, higher organisms such as fungi, plants and animals would not have been able to exist without the oxygen in the atmosphere and would therefore not have evolved if it were not for cyanobacteria.

Figure 13: Polished vertical section through stromatolites (from: https://www.google.co.za/imgres?imgurl=http%3A%2F%2Fwww.therockgallery.co.uk%2Fekmps%2Fshops%2Ftherockgallery%2Fimages%2Fstromatolite-large-polished-slice-100-million-years-old-andes-mountains-boli)

Figure 14: : Domal structures of stromatolites seen from above (from: https://www.google.co.za/imgres?imgurl=http%3A%2F%2Fwww.kidsdiscover.com%2Fwp-content%2Fuploads%2F2015%2F04%2FBacteria_2.jpg&imgrefurl=http%3A%2F%2Fwww.kidsdiscover.com%2Fspotlight%2Fbacteria%2F%3Fmc_cid%3D97b6810d71%26mc_eid%3Df31cca173c&docid=jpZALMrhmI6d1M&tbnid=6zCWRFeJArwpQM%3A&vet=10ahUKEwioiMq6z6jcAhWisqQKHTkzCSoQMwhCKAMwAw..i&w=1000&h=683&bih=344&biw=553&q=Bacteria_2%20stromatolites&ved=0ahUKEwioiMq6z6jcAhWisqQKHTkzCSoQMwhCKAMwAw&iact=mrc&uact=8)

8. CONCLUSION AND RECOMMENDATIONS

Although stromatolites are considered to be fossils, there are hundreds of square kilometres of stromatolites in South Africa and it is not considered to be so scarce that every stromatolite has to be preserved. In the event of the discovery of an exceptional stromatolite formation it is advised that it should on principle not be destroyed if an alternative position for the building of a structure can be found.

If rocks are exposed during development, it is possible that stromatolitic structures could be exposed. The Chance Find Procedure should be followed if an exceptional stromatolitic structure is exposed during development.

9. DECLARATION OF INDEPENDENCE

I. Jacobus Francois Durand declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Palaeontological specialist:

Dr JF Durand (Sci. Nat.)

BSc Botany & Zoology (RAU), BSc Zoology (WITS), Museology Dipl. (UP),

Higher Education Diploma (RAU), PhD Palaeontology (WITS)

10.PROCEDURE FOR CHANCE PALAEONTOLOGICAL FINDS

Extracted and adapted from the National Heritage Resources Act, 1999 Regulations Reg No. 6820, GN: 548.

The following procedure must be considered in the event that previously unknown fossils or fossil sites are exposed or found during construction of the road:

1. Surface excavations should continuously be monitored by the ECO and any fossil material be unearthed the excavation must be halted.

2. If fossiliferous material has been disturbed during the excavation process it should be put aside to prevent it from being destroyed.

3. The ECO then has to take a GPS reading of the site and take digital pictures of the fossil material and the site from which it came.

4. The ECO then should contact a palaeontologist and supply the palaeontologist with the information (locality and pictures) so that the palaeontologist can assess the importance of the find and make recommendations.

5. If the palaeontologist is convinced that this is a major find an inspection of the site must be scheduled as soon as possible in order to minimise delays to the development.

From the photographs and/or the site visit the palaeontologist will make one of the following recommendations:

a. The material is of no value so development can proceed, or:

b. Fossil material is of some interest and a representative sample should be collected and put aside for further study and to be incorporated into a recognised fossil repository after a permit was obtained from SAHRA for the removal of the fossils, after which the development may proceed, or:

c. The fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed.

7. If any fossils are found then a schedule of monitoring will be set up between the developer and palaeontologist in case of further discoveries.

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