



Phase 1: Heritage Impact Assessment for the proposed confirmatory drilling and mining related activities for Makhado Colliery, Vhembe District Municipality

Limpopo Province



Compiled for: Baobab Mining & Exploration (PTY) LTD

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I. Technical and Executive Summaries

i.i. Technical Summary

Property details	
Province	Limpopo
Magisterial District	Musina
Topo-cadastral map	2229 DD
Coordinates	S 22°.49'27.02" E 29°.55'.03.06
Closest town	Makhado
Farm name	Windhoek 649 MS & Tanga 648 MS

Development criteria in terms of Section 38(1) of the NHR Act	Yes	No
Construction of road, wall, power line, 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 exceeding 5000 sq m	Yes	
Development involving three or more existing erven or subdivisions		
Development involving three or more erven or divisions that have been consolidated within past five years		
Rezoning of site exceeding 10 000 sq m		
Any other development category, public open space, squares, parks, recreation grounds		

Development	
Description of development	Mining – confirmatory drilling and associated mining infrastructure
Project name	Makhado Colliery
Developer	MCM Mining
Heritage consultant	Millennium Heritage Pty Ltd
Purpose of the study	Heritage Impact Assessment to identify and assess significance of sites (if any) to be impacted by the proposed development.

Land use	
Previous land use	Agriculture
Current land use	Proposed coal mining, nature reserve

II. Executive Summary

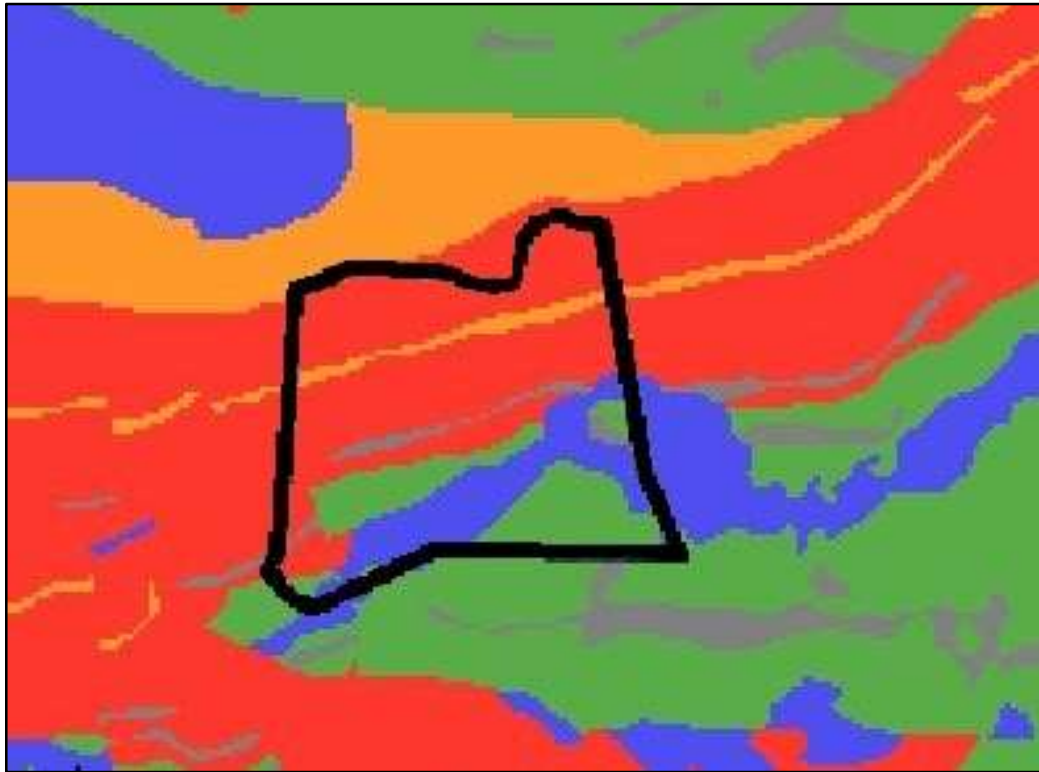
MCM Mining seeks to mine the rich coal deposits on the farms Windhoek 649 MS and Tanga 648 MS, about 30 kilometers north of Louis Trichardt in Limpopo Province. Located along the flats of the Soutpansberg, the proposed project is known as the Makhado Colliery. As part of applications for authorizations, and good corporate citizenship, a heritage impact assessment (Roodt 2011 and 2012) was performed as part of the broader EIA to assess the impact of the development on the receiving environment including heritage resources. The EIA (Jacana 2012) and HIA were approved subject to the condition that any subsequent project implementation phases must be preceded by an assessment of their impact on heritage resources (DEA 2012).

In line with these statutory requirements, this report provides an assessment for the confirmatory drilling activities and establishment of ancillary mining infrastructure as approved by the statutory bodies. This proposed implementation follows the guidance provided by identified heritage sites (Roodt 2012) and the statutory provision that outlaws mining within 100m of waterbodies (Jacana 2012). Nationally, the study was conditioned by the provisions of the National Heritage Resources Act of 1999 and supporting regulations such as the South African Heritage Resources Agency Minimum Standards for Specialist Heritage Studies (Archaeology, Palaeontology, Built Environment and Living Heritage). In order to produce an up best practice product, the assessment was also informed by the international standards such as the ICOMOS Guidelines on Impact Assessment near World Heritage places, and ICOMOS Australia's Burra Charter. Furthermore, the Technical workshop hosted by UNESCO and Mining Companies held in Cairns in 2000 published standards which mining companies must adhere to ensure that they safeguard heritage and the environment. When combined, these standards of best practice motivate for robust impact assessment processes and a cautious approach to the management of sites. They set out firmly that the cultural significance of heritage places must guide all decisions, developmental and otherwise.

Other than these regulatory instruments, the community of nations forming the United Nations has established the **United Nations Sustainable Development Goals** that target among other things to end poverty, protect the planet and ensure prosperity for all by the year 2030. In addition, the Africa Union developed **Agenda 2063** “*The Africa We Want*”, which is the continent’s 50-year development blueprint which aims to utilize the continent’s natural and cultural heritage resources to improve the standard of living for the continent’s inhabitants. Taken together, the SDGs and Agenda 2063 have established sustainable development as an international agenda and a common vision for African countries.

The study marshalled numerous techniques to collect data on which impact assessment was based on. It began with a desktop study to understand archaeology and palaeontology of the area (Loubser 1991; Huffman 2007; Antonites 2012; Durand 2018). This was followed by a review of the approved HIA of Roodt (2012). Thereafter, the identified archaeological and heritage sites were verified through detailed field walking. The coordinates of the sites were inputted into a Garmin Montane 650 GPS with a tracking software leading the team to each and every site. This led to the confirmation of previously identified sites and a re-assessment of significance since the first study was done. As a precautionary measure, a random field survey was performed to ensure that there was a 75 % coverage of the area proposed for development. No new sites were discovered in the process. A field assessment of palaeontological heritage in the study area was performed based on a combination of random sampling and inspection of exposed rocks and the stratigraphy of exposed areas on the farms Windhoek 649 MS and Tanga 648 MS.

The palaeontological sensitivity map below shows that the proposed development will take place in an area of Very High to Insignificant Palaeontological Sensitivity. However, the mining will be focused on the area with the blue and the green which is low to moderate in palaeontological sensitivity. Meanwhile, a plot of the known and identified archaeological and historical sites shows that the proposed development will impact numerous sites of varying significance including three burials. These must be mitigated before mining activities are commenced.



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.

Figure 1: Palaeosensitivity map of the study area (black polygon) and surroundings (SAHRA, 2018) (Map adapted from Durand 2018)

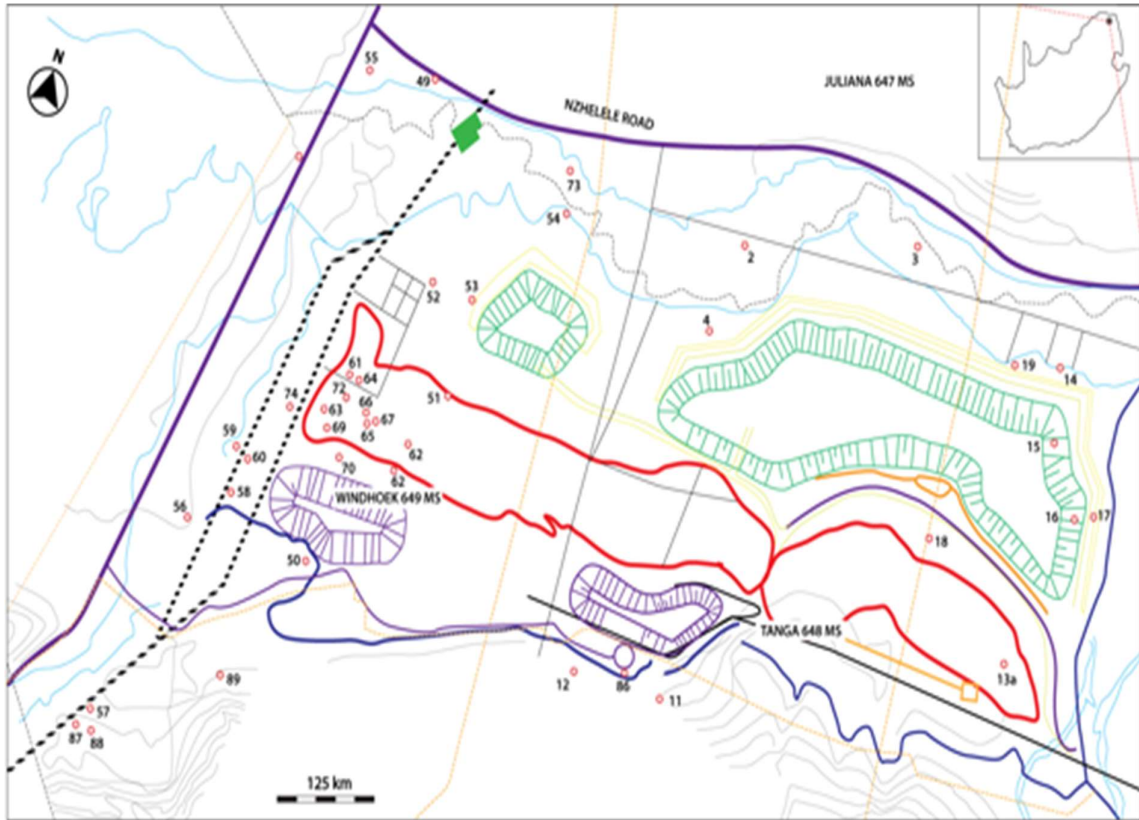


Figure 2: Map of the identified archaeological and historical sites plotted in relation to the proposed development (Map: Millennium Heritage Group).

Based on this mixed approach which also included interviews with key MCM personnel and stakeholder engagement, the assessment reached the following conclusions:

- ✓ Although the proposed area for development is situated in an area that is both highly and lowly sensitive for fossils, no fossils were found on the farms Windhoek 649 MS and Tanga 648 MS.
- ✓ The assessment confirmed the existence of archaeological sites reported during the first study.
- ✓ A reassessment of significance found that some sites on the proposed development footprint had potential to add more information to the history of farming communities in northern South Africa.

- ✓ Stone tools were observed on eroded waterways and appear mostly out of context.
- ✓ The study also confirmed the presence of three graves on the proposed site for development. It is not possible to avoid these during development.

Based on these conclusions, the following recommendations were reached:

- ❖ The identified sites found in the proposed development footprint must be subjected to Phase 2 studies
- ❖ Following community consultation and engagement, the graves must be relocated, from the development footprint
- ❖ Ground disturbing activities that cut across rocks the fossil rich Madzaringwe Formation geological strata must be monitored for fossils
- ❖ A Heritage Management Plan must be developed to protect sites outside development footprint, including sacred heritage places.

Declaration of Independence and CV

We, Shadreck Chirikure and Eric Mathoho declare that we are independent consultants and have no business, financial, personal or other interest in the proposed development, application or appeal in respect of which we were 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 our performing such work.

Signed:



Shadreck Chirikure, MA, PhD, (UCL) (ICHAM Expert Member, ASAPA Member),
Archaeologist and heritage expert.



Eric Mathoho, MA, ASAPA Member, Archaeologist and Heritage Expert

1. Introduction

Limpopo Province is rich in mineral resources such as coal which are essential in addressing energy challenges and other developmental needs of South Africa. The proposed project is an open cast mine on the farms Windhoek 649 MS and Tanga 648 MS (Fig 1), which are all located north of Makhado Town, along the foothills of the Soutpansberg. Before exploration by Baobab Mining Company, these farms were used for agriculture and cattle keeping before being converted into game farming. As part of the environmental authorization process, a heritage study was performed in 2012 (Roodt 2012) and identified several archaeological and recent past sites on these two farms. This earlier work heritage study, however did not include a palaeontological assessment to determine the fossil sensitivity of the research area. Such an omission was rectified through a combined desktop and field assessment of the palaeontology of the study area by Dr Francois Durand (see Appendix 1). The proposed development activities will include the proposed open pit mining site (6 km [east to west] by 1 [north to south] km, workers residential quarters, and office space. The proposed development will use preexisting road infrastructure approved during the EIA process.



Figure 3: View of the study area

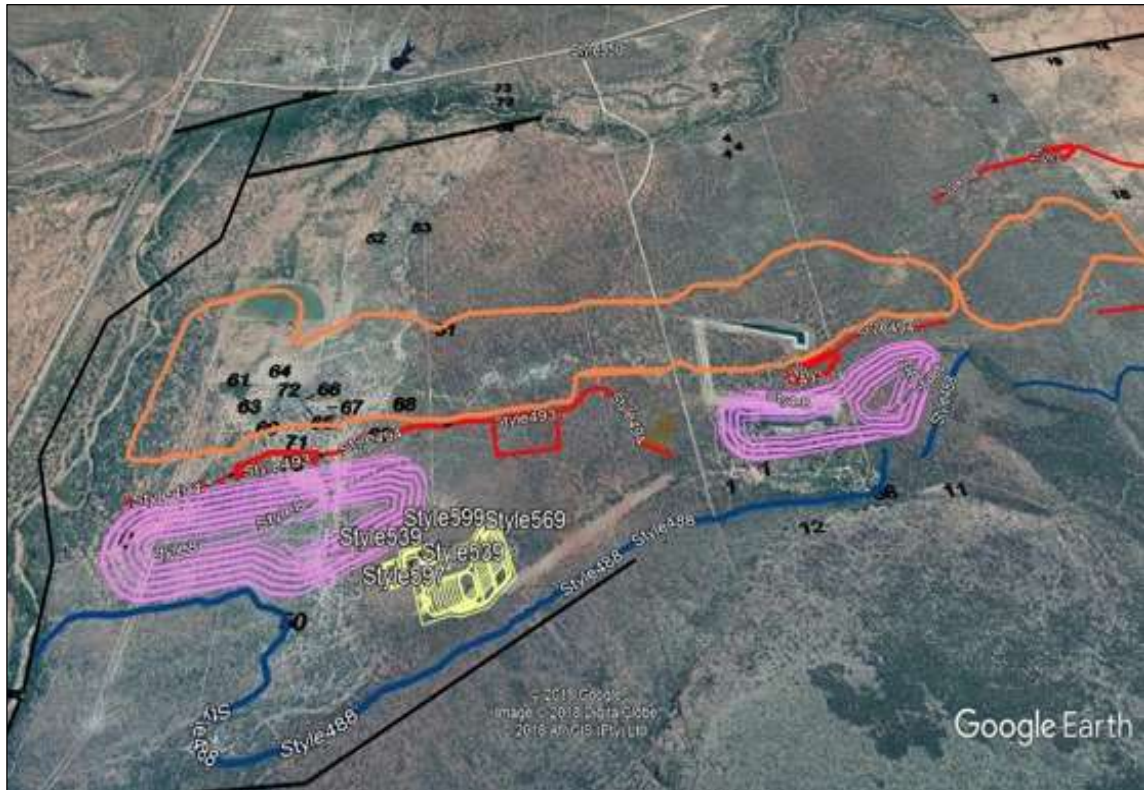


Figure 4: View of the study area adopted from Google Earth. Note the identified sites and mining related developments.

A study of available literature exposes the potential of fossils in the geological strata (Madzaringwe Formation) containing coal deposits (Durand 2018) and a long sequence of human occupation from the Earlier Stone Age through the Middle Stone Age to the later Stone Age. The Stone Age was culturally succeeded by the Early, Middle and Later Iron Ages and recent Venda histories in the study area (Loubser 1991; Roodt 2012; Antonites 2014). Indeed, Roodt (2012) identified a multitude of Iron Age sites of varying significance. Given this sensitivity, adequate care is necessary to ensure that the drilling and related developments avoid direct or indirect impact on the known sites, without mitigation. The objective of the current study is to re-confirm the presence of archaeological and historical sites identified in the previous study (Roodt 2012) and to identify palaeontological sites, and any new archaeological, and living heritage sites, to inform and provide guidance on the proposed drilling and mining related activities. One of the limitations put forward by Roodt (2012) was that there existed elephant herds on other farms, which limited access to certain areas. This was no longer the case as there has been a change of land use. In the end, and using results of field based

palaeontological, archaeological and living heritage assessment, the study makes recommendations for Phase 2 work to enable the preservation of sites by record or in situ, as provided for by the provisions of the National Heritage Resources Act of 1999.

2. Project Description

The proposed Makhado Coal Mine will be an opencast mining operation, with an estimated 8.5-14 MT of ROM coal to be produced per year (Jacana 2012). The life of the mine is estimated to be 16 years. The first phase of the colliery will concentrate on the opencast pit known as the West Pit (located on Windhoek 649 MS and Tanga 648MS Farms) (Figure 3). Data obtained from approved mining plans provides the extent of mining as follows:

- West Pit – 280 ha, maximum depth 120m.

In addition to the open pit, the colliery will consist of the following surface workings:

- Topsoil stockpiles;
- Overburden stockpiles (for start-up period until a wedge has been opened up in the pits so that the overburden can be used as fill);
- ROM coal storage area;
- Intermediate crusher/screening plant);
- Associated conveyors from intermediate crusher/screening plants to the processing plant;
- ROM coal processing plant (primary, secondary and tertiary crusher);
- Associated conveyors from the processing plant to the product storage areas;
- Product stockpile areas and overland conveyor to RLT on farm Tanga;
- Carbonaceous (discard) stockpile area;
- Haul roads and service roads, including a bridge over the Mutamba River;
- Earthmoving vehicle workshops;
- Clean and dirty water management infrastructure;
- Water storage structures and settling ponds;
- Water reticulation systems;
- Change houses and offices;
- Wastewater (sewage) treatment plant;

- Main entrance gate security and freight area;
- Bulk electricity supply infrastructure;
- Bulk water supply infrastructure (still to confirm);
- Bulk fuel storage facilities;
- Explosives magazine;
- Recruitment and training center;
- Product transport infrastructure (railway line);
- Security structures and fences.

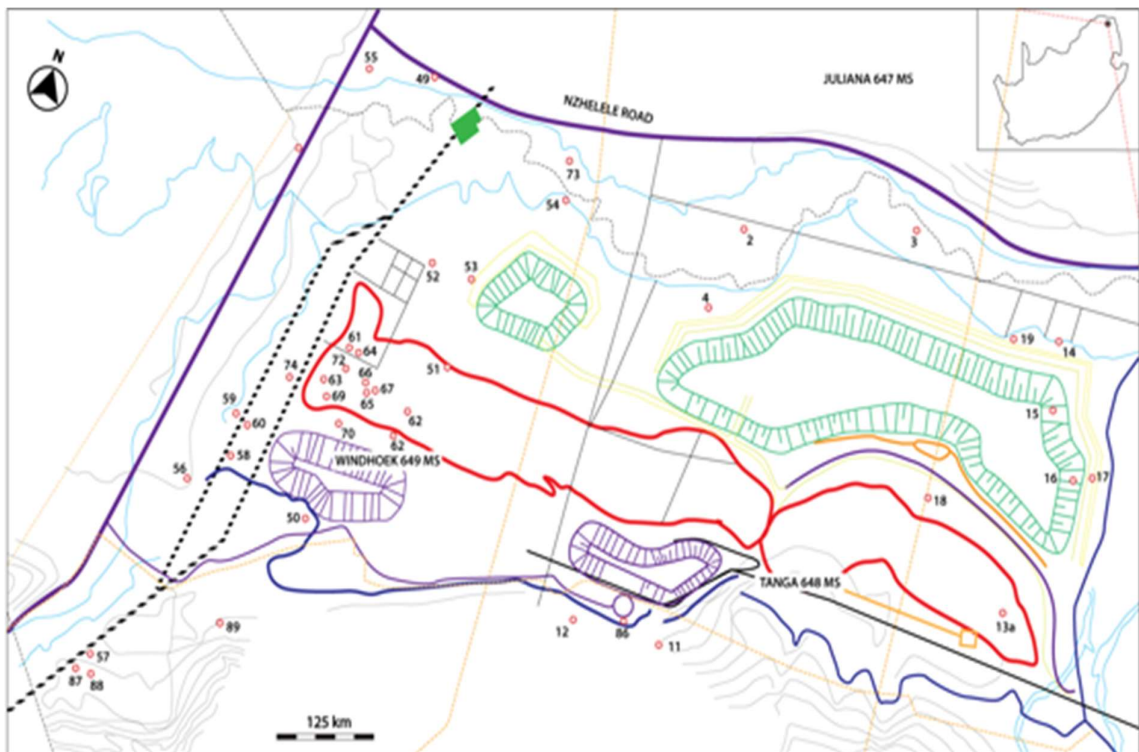


Figure 5: View of the affected farms, identified heritage resources and layout of proposed developments

3. Terms of reference

Undertake a Heritage Impact Assessment (archaeology, palaeontology and living heritage) for the proposed Confirmatory drilling activities including mining and infrastructure development on the farms Windhoek 649 MS and Tanga 648 MS in the

Soutpansberg area, Limpopo Province and to submit a specialist report, which addresses the following:

- Executive summary;
- Scope of work undertaken, assumptions and limitations;
- Methodology used to obtain supporting information;
- Overview of relevant legislation and international best practice;
- Results of all investigations;
- Interpretation of information;
- Assessment of impacts (including cumulative impacts) associated with all the stages of the project (construction, operation, closure and post closure);
- Recommendations on other management measures;
- References.

4. Legislation: National and International standards of best practice

Nationally, two sets of legislation are relevant for this study with regard to the protection of tangible and intangible heritage resources including graves. These are as follows:

4A. The National Heritage Resources Act (25 of 1999) (NHRA)

This act makes provision for the identification, protection and conservation of heritage in South Africa through various sections. As far as development is concerned, the NHRA mandates that predevelopment heritage resources impact assessments must be performed for various categories of development as enshrined in Section 38. Section 7 of the act further provides for the grading of heritage resources based on values and significance. Grade 1 sites are National Heritage sites (national significance), while Grade II sites are provincial sites (provincial significance) with Grade III being mostly local (local significance). In terms of cumulative impact assessment, a higher concentration of Grade III resources may have huge significance when compared to individual sites.

In terms of the National Heritage Resources Act (1999) the following categories of the national estate are of relevance:

Historical remains

Section 34(1): No person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the heritage resources authority (national or provincial).

Archaeological remains

Section 35(3): Any discoveries of archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must be immediately reported to responsible heritage resources authorities.

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 from 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.

Burial grounds and graves

Subsection 36(3)

- (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority-
- (c) 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
- (d) 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 detection or recovery of metals.

Subsection 36(6) Subject to the provision of any 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 plan for the exhumation and re-interment of the content of such grave or, in the absence of such person or community, make any such arrangement as it deems fit.

Culture Resource Management

Subsection 38(1) Subject to the provisions of subsection (7), (8) and (9), any person who intends to undertake a development must at the very earliest stages of initiating such development notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. Development refers to any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including

(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place.

The Human Tissues Act (65 of 1983)

This Act protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and reburial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities. Public consultation is essential in all this.

4B. The ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011) and ICOMOS Australia Burra Charter

The International Council of Monuments and Sites (ICOMOS) has established guidelines for carrying out impact assessments near World Heritage sites. The principles that underwrite the guidelines however apply to all categories of heritage. In conjunction with these guidelines, ICOMOS Australia published the Burra Charter which argues that the cultural significance of places must guide decisions made on heritage places. Taken together, the ICOMOS Guidelines and the Burra Charter makes a strong case for cumulative impact assessment which focuses on the direct and indirect impact caused by any proposed development on heritage places. These guidelines define impacts as follows:

- Direct impacts are those which result in the total destruction or altering of attributes of a heritage place.
- Indirect impacts are those whose impact is not clearly visible and quantifiable.
- Cumulative impacts refer to the sum of direct and indirect impacts in the short and medium to long term (ICOMOS 2011).

In addition, community engagement is essential in making decisions relating to heritage places. MCM has embarked on a robust community engagement program which has built rapport with local communities including chiefs and farmers (see Appendix xxx). In so doing, the company implements the provisions of the 2000 Technical Meeting between UNESCO and the world's mining companies. The recommendations of the committee make it explicit that communities must benefit from projects while their heritage and environment must be safeguarded. In a way, this also has deep synergies with the SDGs and the African Union's Agenda 2063. In summary, international best practice mandates that cultural significance of heritage places must determine all decisions and that heritage conservation interests must be balanced with development as the two are not mutually exclusive. This report combines this logic with the provisions of the National Heritage Resources Act of 1999 to ensure that the proposed development balances the interests of conservation (in situ or by record) as well as

development to promote poverty alleviation within a framework provided by compliance requirements and good corporate citizenship.

5. Assumption and Limitations

The heritage record is made up of remains that lie either on or beneath the ground. While those above ground may be visible, those underneath may not be easily visible unless the ground is exposed. The major limitation encountered in this study was that assessment was only limited to what was observable above the ground or exposed through sections where the area beneath the surface was exposed by erosion or human action. It is possible that palaeontological material and sub-surface archaeological material may exist and which may be uncovered during development. However, should this happen, the chance discoveries must immediately be reported to the nearest heritage authority.

6. Data sources and methodology

According to the South African Heritage Resources Agency Minimum Standards for Specialist heritage studies: *“HIA reports must identify, assess and record current conditions and locations of all heritage resources in the area proposed for development and impact zone, the impact of the development on the identified heritage resources or landscapes and make recommendations for protection or mitigation to reduce the impact on the resources”*. The approach and methodology adopted in this report was meant to achieve this.

A. Literature review: Background to the heritage resources of the of the research area

i. .The fossil record

The study relied on unpublished and published sources of information including online databases such as Google Earth and Google Scholar. Previous impact assessment reports were also consulted together with academic literature such as Brandl (1980), Loubser (1991), Huffman (2007) and among others Antonites (2012).

South Africa is richly endowed with palaeontological heritage which has illuminated in varying ways biological evolution in the entire world (Durand 2018). Geological, the rocks of the study area belong to the older Soutpansberg Group (Mololian) which is overlain by rock formations of the younger Karoo Supergroup (Permian to Jurassic). Existing work shows that the Soutpansberg rocks have a very low fossil sensitivity. It is the coal rich rocks of the Karoo Supergroup (Madzaringwe and Mikandeni Formations) which are known to be fossil rich. The Madzaringwe Formation consists of up to 200 m alternating sandstone, siltstone and shale containing thin coal seams while the Mikambeni Formation is comprised of mudstones, shales and laminated sandstones reaching up to 150 m in thickness. Coal seams are known to occur in the coal rich Madzaringwe and Mikambeni Formations, all of which are known to exist in the study area.

ii. The Stone Age Period

Most of the research on the Stone Age in northern South Africa took place in the Mapungubwe National Park about 130 km to the west of the proposed area. Nevertheless, a general account of the nature of the Stone Age can be provided. Conventionally speaking, the Stone Age period has been divided into the Early Stone Age (ESA) (3.5 million and 250 000 BP), the Middle Stone Age (MSA) (250 000 – 25 000 BP) and the Later Stone Age (25 000 – 2 000 BP) (Phillipson 2005). Early Stone Age stone tool assemblages are made up of the earlier Oldowan and later Acheulian types. The Oldowan tools were very crude and were used for chopping and butchering. These were replaced by Acheulian ESA tools dominated by hand axes and cleavers which are remarkably standardized (Wadley, 2007; Sharon, 2009). Evidence presented from Sterkfontein, Swartkrans and Makapansgat caves shows that the first tool making hominids belong to either an early species of the Homo or an immediate ancestor which is yet to be discovered here in South Africa (Phillipson 2005; Esterhuysen, 2007). Both the Oldwan and Acheulian industries are well represented in the archaeology of northern South Africa as shown by studies in the Mapungubwe National Park (Kuman et al. 2005; Sumner and Kuman 2014).

The Middle Stone Age dates to between 250 000 ago and 25 000 years ago. In general, Middle Stone Age tools are characterized by a size reduction in tools such as hand axes,

cleavers, and flake and blade industries. The period is marked by the emergence of modern humans and was accompanied by change in technology, behavior, physical appearance, art, and symbolism (Phillipson 2005). A variety of MSA tools includes blades, flakes, scraper and pointed tools that may have been hafted onto shafts or handles and used as spear heads. Surface scatters of these flake and blade industries occur widespread across southern Africa (Klein 2000; Thompson & Marean, 2008). Residue analyses on some of the stone tools indicate that these tools were certainly used as spear heads (Wadley, 2007). From about 25 000 BP, stone tool assemblages generally attributed to the Later Stone Age emerged. This period is marked by a reduction in stone tool sizes. Typical stone tools include microliths and bladelets. Later Stone Age stone tools were recovered in the Mapungubwe National Park area (Forsman 2011). This period is also associated with the development of rock art whose distribution is known across southern Africa (Deacon and Deacon 1999; Phillipson 2005).

iii. Farming communities, recent histories and living heritage

Beginning in the early first millennium AD, farming communities who made a distinctive type of pottery, settled permanently settled in villages, and cultivated crops and raised animals appeared in southern Africa (Maggs, 1980; Loubser, 1988; Huffman 2007). Typical Early Iron Age sites are known along river banks and waterways. Sites dating to the Early Iron Age are known to occur to the west of the Nzhelele valley at Klein Africa and Happy Rest. These sites were first identified by De Vaal (1941) and were later excavated by Helgaard Prinsloo (1974). Around AD900, the Middle Iron Age developed and is well known from sites in the Middle Limpopo such as K2 and Mapungubwe. Middle Iron Age sites are known in and around Musina and near the Soutpansberg Range of Mountains. Some known sites include the sites of Mutamba, found along the Mutamba river (Antonites 2012). The Middle Iron Age was succeeded by the Late Iron Age after AD1300. Khami type sites are known in the study area and beyond. These are defined by the presence of characteristic band and panel pottery and drystone built terraces where houses were built. The Khami period is associated with the formation and development of a Venda identity (Loubser 1991). Khami type sites continued into the late 19th century and are associated with various Venda communities. Some of the most well-known Khami sites include Dzata located in the Nzhelele

Valley. The late 19th century saw the introduction of European colonialism. Over the course of the 20th century, local communities were resettled to give way to European farms as well as for state activities. Often, these forced removals were not accompanied by exhumations of burials and other sensitive cultural remains. The expectation is that a mix of these heritage resources with tangible and intangible values exist in the area proposed for development.

B. Heritage-specific Consultation

The area where the proposed development falls is historically associated with Venda communities. However, from the late 19th and early 20th centuries, European farms were established in the area thereby introducing people of western ancestry into this region. Burials and living heritage associated with these historical layers exist. A detailed heritage consultation programme was developed to identify living heritage sites and link burials to descendants. The consultation involved chiefs, farm owners and farm labourers. The process fed into the broad environment impact assessment process. The Mulaudzi family who are descendants of one of the buried on the western part of the farm Windhoek were also consulted.

C. Physical Survey

Subsequent to the desktop archaeology and palaeontological study, field walking was performed on the farms Windhoek 649 MS and Tanga 648 MS. As far as the archaeology is concerned, the coordinates of sites recorded in Roodt (2012) were loaded onto a Garmin Montane 650 GPS, with a tracking mode. The sites were then identified individually resulting in checking features that were observable against written descriptions. Furthermore, a targeted field survey was performed on areas proposed for development such as the location of the box pit, the staff quarters and office blocks and other related activities. This process resulted in the confirmation of sites and an understanding of their significance based on density of material culture, period, and the secure nature of the context of the materials. Interviews were also performed with key MCM members of staff such as geologists, engineers, surveyors and stakeholder engagement and community liaison experts. The fieldwork team was comprised of

Shadreck Chirikure, (PhD, ICOMOS Committee on Cultural Heritage Expert Member), Mr. Eric Mathoho, (MA) and Ms. Dolphin Mabale,(MA) an anthropologist who specialize in Venda and Tsonga living heritage and culture. Photography formed an important part of the documentation together with the mapping of the distribution of sites in relation to proposed development activities. The palaeontological field assessment was performed by Dr Francois Durand (Sci. Nat) based on an assessment of surface indications and exposed underground sections (see Appendix 1).

D. Site description

The standard is to classify heritage resources following the time period which they belong to. This culture historical classification is based on the understanding that in terms human culture, the Early Stone Age is the earliest, followed by the Middle and Later Stone Ages. These were followed by the Earlier, Middle and Later Iron Ages and recent historical communities. As mentioned earlier, the study is in part a reassessment and confirmation of the work conducted by Roodt (2012). The naming of sites followed the convention in that report where the first site to be identified was given the number 1, in sequential format up to the last to be identified.

E. Site Significance and Field-Rating

The significance and rating was based on the provisions of the NHRA Act, the SAHRA Minimum standards and ICOMOS significance. The table below, adopted from the SAHRA Minimum standards was applied in a step towards determining site significance.

Rationale for field rating

The site significance classification standards as prescribed in the guidelines and endorsed by the South African Heritage Resources Agency (2017) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used in determining the site significance for this report. This standard was also compared to that adopted by ICOMOS for sensitive properties such as World Heritage sites. The classification index is represented in Table 1 below that show grading and rating systems of heritage

resources in South Africa alongside that by ICOMOS (ICOMOS Guidance for Impact Assessment near World Heritage properties).

Table 1: *Significance assessment scales based on a reconciliation of ICOMOS and SAHRA Guidelines*

ICOMOS Field Ranking	South African Legislation Field Ranking (National Heritage Resources Act Ranking)
Very high	Field Ranking I (World Heritage Site, National Heritage Sites, (NHRA: Grade 1)
High	Field Ranking II (Provincial Heritage Sites (Grade 2),
Medium (regionally significant sites)	Field Ranking IIIa (Grade 3a (Conservation, mitigation, based on situation)
Low (locally significant sites)	Field Ranking IIIb (Grade 3b (Conservation, mitigation, based on local situation)
Negligible	Field Ranking IIIc (Grade 3c, mitigation)

The evaluation of field significance was based on the following:

- The unique nature of a site.
- The amount/depth of the archaeological deposit and the range of features (stone walls, activity areas etc.).
- The wider historic, archaeological and geographic context of the site.
- The preservation condition and integrity of the site.
- The potential to generate new knowledge

Based on these indicators, the information on significance was condensed into Table 2 below as provided for the SAHRA Minimum Standards.

Table 2: Significance indicators based on the SAHRA Minimum standards

<p>NHRA Section (3) “Without limiting the generality of subsections 1 and 2, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of –“</p>	<p>Applicable or not</p>	<p>Rating Negligible /Low / Low-Medium / Medium / Medium-High / High / Very High</p>
<p>a) its importance in the community, or pattern of South Africa’s history</p>	<p>Yes</p>	<p>Medium</p>
<p>(b) its possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage</p>	<p>No</p>	
<p>(c) its potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage</p>	<p>Yes</p>	<p>Medium</p>
<p>d) its importance in demonstrating the principal characteristics of a particular class of South Africa’s natural or cultural places or objects</p>	<p>Yes</p>	<p>Medium</p>
<p>(e) Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group</p>	<p>Yes</p>	<p>Medium</p>
<p>(f) Its importance in demonstrating a high degree of creative or</p>	<p>Yes</p>	<p>Low</p>

technical achievement at a particular period		
(g) Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons	Yes	Medium/low
(h) Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa	N/A	
(i) Sites of significance relating to the history of slavery in South Africa	N/A	
Reasoned assessment of significance using appropriate indicators outlined above:		No Grades I and II were found, neither are there sites with rare finds unique to specific periods or people

7. Impact Assessment Methodology

Direct, indirect and cumulative impact

Positive and negative impacts on heritage resources take many forms: they may be direct or indirect; cumulative, short term or long term, reversible or irreversible, visual, and physical. For these impacts to be relevant to the HIA study, they must be triggered by the proposed development (ICOMOS 2011).

Direct impacts are those that arise as a primary consequence of the proposed development or change of use. They can result in the physical loss of part or all of an attribute, and/or changes to its setting - the surroundings in which a place is experienced, its local context, embracing present and past relationships to the adjacent landscape (ICOMOS 2011). In the process of identifying direct impacts, effort must be invested in considering cumulative impact, because a little impact on a few sites may cause extensive damage on a large scale. By their nature, direct impacts are associated

with the development footprint and result in physical loss such that they constitute a major threat to OUV. Direct impacts resulting in physical loss are usually permanent and irreversible.

Indirect impacts occur as a secondary consequence of construction or operation of the development, and can result in physical loss or changes to the setting of an asset beyond the development footprint.

The scale or severity of impacts or changes can be judged taking into account their direct and indirect effects and whether they are short or long term, reversible or irreversible. The cumulative effect of separate impacts should also be considered.

International best practice indicates that every reasonable effort should be made to avoid, eliminate or minimise adverse impacts on heritage resources and other significant places. Ultimately, however, it may be necessary to balance the public benefit of the proposed change against the harm to the place (ICOMOS 2011; UNESCO et al. 2010). In the case of developing countries such as South Africa, maintaining such a balance is important.

Table 3 shows the evaluation of impact based on the provisions of the National Environmental Management Act (NEMA).

Table 3: *Impact assessment variables and scales using provisions of NEMA*

Evaluation Component	Rating Scale and Description/criteria
MAGNITUDE of negative impact (at the indicated spatial scale)	10 - Very high: Bio-physical and/or social functions and/or processes might be <i>severely</i> altered. 8 - High: Bio-physical and/or social functions and/or processes might be <i>considerably</i> altered. 6 - Medium: Bio-physical and/or social functions and/or processes might be <i>notably</i> altered. 4 - Low : Bio-physical and/or social functions and/or processes might be <i>slightly</i> altered. 2 - Very Low: Bio-physical and/or social functions and/or processes might be <i>negligibly</i> altered. 0 - Zero: Bio-physical and/or social functions and/or processes will remain <i>unaltered</i> .
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	10 - Very high (positive): Bio-physical and/or social functions and/or processes might be <i>substantially</i> enhanced. 8 - High (positive): Bio-physical and/or social functions and/or processes might be <i>considerably</i> enhanced. 6 - Medium (positive): Bio-physical and/or social functions and/or processes might be <i>notably</i> enhanced. 4 - Low (positive): Bio-physical and/or social functions and/or processes might be <i>slightly</i> enhanced. 2 - Very Low (positive): Bio-physical and/or social functions and/or processes might be <i>negligibly</i> enhanced. 0 - Zero (positive): Bio-physical and/or social functions and/or processes will remain <i>unaltered</i> .
DURATION	5 - Permanent 4 - Long term: Impact ceases after operational phase/life of the activity > 60 years. 3 - Medium term: Impact might occur during the operational phase/life of the activity – 60 years. 2 - Short term: Impact might occur during the construction phase - < 3 years. 1 - Immediate

EXTENT (or spatial scale/influence of impact)	5 - International: Beyond National boundaries. 4 - National: Beyond Provincial boundaries and within National boundaries. 3 - Regional: Beyond 5 km of the proposed development and within Provincial boundaries. 2 - Local: Within 5 km of the proposed development. 1 - Site-specific: On site or within 100 m of the site boundary. 0 - None
IRREPLACEABLE loss of resources	5 – Definite loss of irreplaceable resources. 4 – High potential for loss of irreplaceable resources. 3 – Moderate potential for loss of irreplaceable resources. 2 – Low potential for loss of irreplaceable resources. 1 – Very low potential for loss of irreplaceable resources. 0 - None
REVERSIBILITY of impact	5 – Impact cannot be reversed. 4 – Low potential that impact might be reversed. 3 – Moderate potential that impact might be reversed. 2 – High potential that impact might be reversed. 1 – Impact will be reversible. 0 – No impact.
PROBABILITY (of occurrence)	5 - Definite: >95% chance of the potential impact occurring. 4 - High probability: 75% - 95% chance of the potential impact occurring. 3 - Medium probability: 25% - 75% chance of the potential impact occurring 2 - Low probability: 5% - 25% chance of the potential impact occurring. 1 - Improbable: <5% chance of the potential impact occurring.
Evaluation Component	Rating Scale and Description/criteria
CUMULATIVE impacts	High: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. Medium: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. Low: The activity is localised and might have a negligible cumulative impact. None: No cumulative impact on the environment.

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

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

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental/Heritage Significance of each potential environmental impact as per Table 3 below. The Environmental Significance rating process is completed for all identified potential environmental impacts both before and after implementation of the recommended mitigation measures.

Table 4: *Rating of the Environmental/Heritage Significance using Significance Score*

Significance Score	Environmental Significance	Description/criteria
125 – 150	Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	High (H)	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.

75 – 99	Medium-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	Medium (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	Low (L)	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

8. Impact assessment results

Desktop studies

A study of the report by Roodt (2012) identified numerous sites on the Farms Windhoek and Tanga (Fig 4). The sites were reconfirmed through a detailed field study during which their significance was reassessed (Table 5).



Figure 6: View of the study area with Plotted archaeological sites indicated by numbers adopted from Roodt (2012) report

Table 5: Reconfirmed Archaeological sites

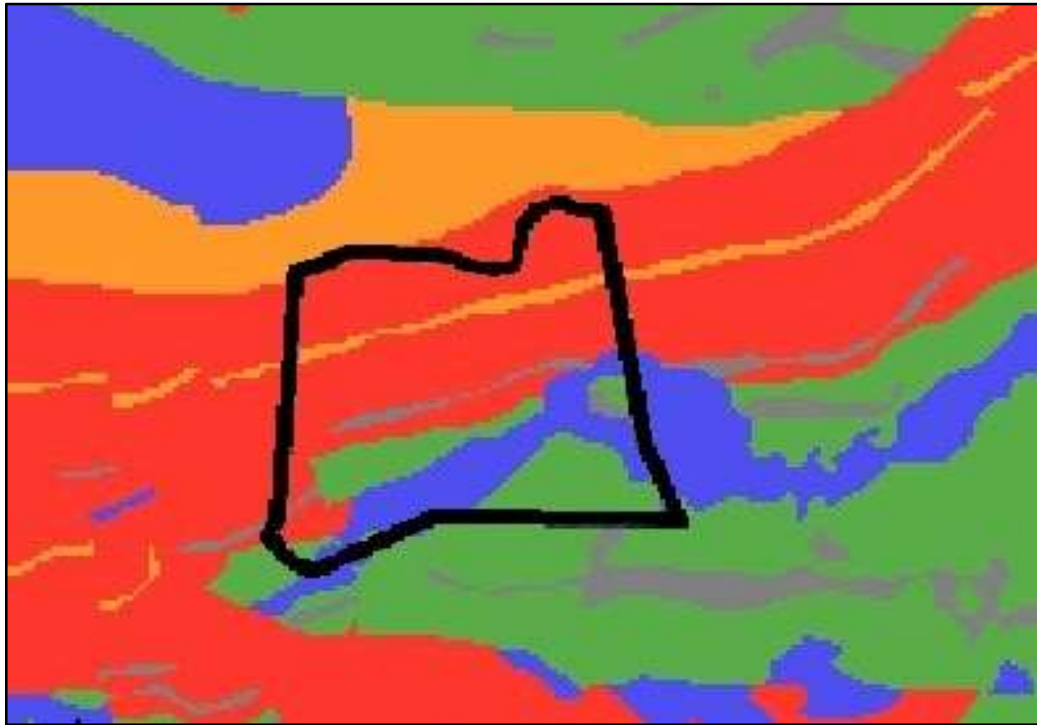
Site number	Old No.	Farm	Description
1. GPS S 22°.49'27.02" E 29°.55'.03.06" S 22°.49' 27.03" E 29°.55'.00.00" S 22°.49'26.03" E 29°.55'.01.01"	1 2 9	Tanga 648 MS	Recent past homestead/ hunting camp: ruins foundation, mud wall and oval parked stones as grave dressing (According to an informant the site was abandoned in the early 1970s).
# S 22°.49'24.02" E 29°.55'.04.03" # S 22°.49'26.07" E 29°.55'.12.01"		Tanga Tanga	Possible grave Indicated by parked stones as grave dressings. The area seem to be part of a hunting camp Grave: disturbed oval parked stones grave dressings in the middle of a non-perennial stream.
2. S 22°.48'06.03" E 29°.55'.04.02" S 22°.48'10.00" E 29°.54'.59.06"	3 4	Tanga	Iron Age pottery remains between Mutamba River and a low sandstone outcrop. Contains diagnostic and undiagnostic ceramics
3. S 22°.47'47.03" E 29°.55'.43.09"	5	Tanga	Iron Age remains: contain low scattered ceramics and top grinding stone
4. S 22°.48'22.07" E 29°.55'.06.02"	#	Tanga	Recent past site on undulating calcrete rocky outcrop, the area has been disturbed with discarded dried trees stumps. Contains undiagnostic ceramics, porcelain pieces, glass and iron pieces and a possible grave, indicated by parked stone outline.
11. S 22°.49'29.05" E 29°.55'.29.05"	17	Tanga	Iron Age remains on the foothills of the mountain. Contains circular stone wall

12. S 22°.48'22.07" E 29°.55'.06.02"	18	Tanga	Iron Age remains on the foothills of the mountain. Contain low scattered undiagnostic ceramics and a single enclosure. A gravel road transverse the site
86.	100	Tanga	Dried up fountain
50. S 22°.49'44.08" E 29°.53'.59.08"	59	Windhoek 649MS	Low concentration ceramics on outcrop
51. S 22°.49'44.08" E 29°.53'.59.08"	60	Windhoek	Scattered ceramics in association with possibly grain bins stands
52. S 22°.48'44.01" E 29°.54'.01.04"	61.	Windhoek	Low ceramic concentration on flood plain
53. S 22°.48'41.09" E 29°.54'.09.01"	62.	Windhoek	Cattle enclosure and midden deposit
54. S 22°.48'17.09" E 29°.54'.22.06"	63	Windhoek	Stone Age material and pottery scattered-possibly Gumanye ceramics the area is dominated by Mopane bushveld.
58 S 22°.49'40.09" E 29°.53'.32.01	67	Windhoek	Possible indicated by parked stones as grave dressing.
59. S 22°.49'35.05" E 29°.53'.30.05 S 22°.49'32.03" E 29°.53'.29.04	68 69	Windhoek	Iron Age remains on floodplain, possibly Mutamba.
62. S 22°.48'17.09" E 29°.54'.22.06	72.	Windhoek	Single grave & homestead foundation
64. S 22°.49'10.04" E 29°.53'.51.00	74.	Windhoek	Non-diagnostic pottery on calcrete raised, previously ploughed for agricultural purposes
65. GPS S 22°.49'15.04" E 29°.53'.59.01"	75.	Windhoek	A single grave indicated by granite tombstone in scripted: Vhengane Rosina Mulaudzi: Born 06-03- 1910, Died 08 - 04- 1958
66. GPS	76.	Windhoek	Grave-indicated by sand stone engraved: Grobler T.J. Born 1856, date of death unknown

S 22°.49'14.03" E 29°.53'.59.00"			
67. GPS S 22°.49'15.02" E 29°.54'.02.05"	77.	Windhoek	Grave, oval parked calcrete stones as grave dressings
68. GPS S 22°.49'13.02" E 29°.53'.57.04"	78.	Windhoek	Remains of recent past farm homestead: contains burnt clay bricks, foundation, concrete rubbles and associated remains of ablution and French drain, glass, broken pieces of porcelain, copper spoons and metal objects. According to Roodt (2011) <i>sampled bottle dated to circa 1910-1930</i>
70. S 22°.49'23.07" E 29°.53'.56.02	80	Windhoek	Non diagnostic ceramic scattered
71. S 22°.49'21.04" E 29°.53'.55.09	81.	Windhoek	Grain bin stand and Non diagnostic ceramic scattered
73. S 22°.48'08.07" E 29°.54'.22.04 S 22°.48'10.08" E 29°.54'.22.01	83 84	Windhoek	Non diagnostic ceramic scattered on raised floodplain the site extend towards the south.
74. S 22°.49'21.02" E 29°.53'.31.01" S 22°.49'16.01" E 29°.53'.32.03"	86a 86b	Windhoek	Iron Age midden deposit with cultural material remains next to Mutamba river bank, contains diagnostic and non-diagnostic ceramics, metal adze recent past nails and glass.

Note: the numbering system was adopted from Roodt (2012) report

A desktop palaeontological study did not find any fossil sites despite the geology having good potential to yield palaeontological heritage.



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.

Figure 7: Palaeosensitivity map of the study area (black polygon) and surroundings (SAHRA, 2018) (Map adapted from Durand 2018)

9. Field Survey and Assessment results

Table 5: *The table below shows the results of the field walking and the recommended management actions.*

Site number	Old No.	Farm	Description	Rating/Action
1. GPS S 22°.49'27.02" E 29°.55'.03.06" S 22°.49' 27.03" E 29°.55'.00.00" S 22°.49'26.03" E 29°.55'.01.01"	1 2 9	Tanga 648 MS	Recent past homestead/ hunting camp: ruins foundation, mud wall and oval parked stones as grave dressing (According to an informant the site was abandoned in the early 1970s).	Mitigation
# S 22°.49'24.02" E 29°.55'.04.03" # S 22°.49'26.07" E 29°.55'.12.01"		Tanga Tanga	Possible grave Indicated by parked stones as grave dressings. The area seem to be part of a hunting camp Grave: disturbed oval parked stones grave dressings in the middle of a non-perennial stream.	Mitigation
2. S 22°.48'06.03" E 29°.55'.04.02" S 22°.48'10.00" E 29°.54'.59.06"	3 4	Tanga	Iron Age pottery remains between Mutamba River and a low sandstone outcrop. Contains diagnostic and undiagnostic ceramics	Outside of development, monitoring
3. S 22°.47'47.03" E 29°.55'.43.09"	5	Tanga	Iron Age remains: contain low scattered ceramics and top grinding stone	Mitigation
4. S 22°.48'22.07" E 29°.55'.06.02"	#	Tanga	Recent past site on undulating calcrete rocky outcrop, the area has been disturbed with discarded dried trees stumps. Contains undiagnostic ceramics, porcelain pieces,	In development footprint, mitigation, Field Rating IIIb

			glass and iron pieces and a possible grave, indicated by parked stone outline.	
11. S 22°.49'29.05" E 29°.55'.29.05"	17	Tanga	Iron Age remains on the foothills of the mountain. Contains circular stone wall	
12. S 22°.48'22.07" E 29°.55'.06.02"	18	Tanga	Iron Age remains on the foothills of the mountain. Contain low scattered undiagnostic ceramics and a single enclosure. A gravel road transverse the site	Outside the development footprint
86.	100	Tanga	Dried up fountain	Outside the development footprint
50. S 22°.49'44.08" E 29°.53'.59.08"	59	Windhoek 649MS	Low concentration ceramics on outcrop	Outside the development footprint
51. S 22°.49'44.08" E 29°.53'.59.08"	60	Windhoek	Scattered ceramics in association with possibly grain bins stands	In development footprint, mitigation, Field Rating IIIb
52. S 22°.48'44.01" E 29°.54'.01.04"	61.	Windhoek	Low ceramic concentration on flood plain	In development footprint, mitigation, Field Rating IIIb
53. S 22°.48'41.09" E 29°.54'.09.01"	62.	Windhoek	Cattle enclosure and midden deposit	In development footprint, mitigation, Field Rating IIIb
54. S 22°.48'17.09" E 29°.54'.22.06"	63	Windhoek	Stone Age material and pottery scattered-possibly Gumanye ceramics the area is dominated by Mopane bushveld.	In development footprint, mitigation, Field Rating IIIb
58 S 22°.49'40.09" E 29°.53'.32.01	67	Windhoek	Possible indicated by parked stones as grave dressing.	Outside the development footprint
59. S 22°.49'35.05" E 29°.53'.30.05 S 22°.49'32.03" E 29°.53'.29.04	68 69	Windhoek	Iron Age remains on floodplain, possibly Mutamba.	Outside the development footprint,(Not affected) No mitigation required

62. S 22°.48'17.09" E 29°.54'22.06	72.	Windhoek	Single grave & homestead foundation	Mitigation after consultation, Field Rating IIIa
64. S 22°.49'10.04" E 29°.53'51.00	74.	Windhoek	Non-diagnostic pottery on calcrete raised, previously ploughed for agricultural purposes	Mitigation, Field Rating IIIc
65. GPS S 22°.49'15.04" E 29°.53'59.01"	75.	Windhoek	A single grave indicated by granite tombstone in scripted: Vhengane Rosina Mulaudzi: Born 06-03-1910, Died 08 -04- 1958	Mitigation after consultation, Field Rating IIIa
66. GPS S 22°.49'14.03" E 29°.53'59.00"	76.	Windhoek	Grave-indicated by sand stone engraved: Grobler T.J. Born 1856, date of death unknown	Mitigation after consultation, Field Rating IIIa
67. GPS S 22°.49'15.02" E 29°.54'02.05"	77.	Windhoek	Grave, oval parked calcrete stones as grave dressings	Mitigation after consultation, Field Rating IIIa
68. GPS S 22°.49'13.02" E 29°.53'57.04"	78.	Windhoek	Remains of recent past farm homestead: contains burnt clay bricks, foundation, concrete rubbles and associated remains of ablution and French drain, glass, broken pieces of porcelain, copper spoons and metal objects. According to Roodt (2011) <i>sampled bottle dated to circa 1910-1930</i>	In development footprint, mitigation, Field Rating IIIb
70. S 22°.49'23.07" E 29°.53'56.02	80	Windhoek	Non diagnostic ceramic scattered	
71. S 22°.49'21.04" E 29°.53'55.09	81.	Windhoek	Grain bin stand and Non diagnostic ceramic scattered	In development footprint, mitigation, Field Rating IIIb
73. S 22°.48'08.07" E 29°.54'22.04 S 22°.48'10.08" E 29°.54'22.01	83 84	Windhoek	Non diagnostic ceramic scattered on raised floodplain the site extend towards the south.	In development footprint, mitigation, Field Rating IIIb
74. S 22°.49'21.02" E 29°.53'31.01"	86a 86b	Windhoek	Iron Age midden deposit with cultural material remains next to Mutamba	On the edge of the proposed development

S 22°.49'16.01" E 29°.53'.32.03"			river bank, contains diagnostic and non-diagnostic ceramics, metal adze recent past nails and glass.	footprint, mitigation, Field Rating IIIb
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Note: the numbering system was adopted from Roodt (2012) report



Figure 8: Grave indicated by granite tombstone.



Figure 9: Grave indicated by parked calcrete stones as grave dressings



Figure 10: Sandstone headrest in scripted. Grobler T.J. Born 1856 date of death unknown.



Figure 11: Farm homestead remains



Figure 12: Recent past remains



Figure 13: Recent past remains of a home stead, according to the informants the area was occupied by Iscor drilling team from 1974-1985



Figure 14: Ash midden with recent past items such as copper fork, plate and broken glass and bottles.



Figure 15: recent past remains of roundavel foundation



Figure 16: ash midden with recent past items, possibly as a results of hunting camp activities



Figure 17: A single grave indicated by oval parked stones as grave dressings



Figure 18: A single grave in the middle of non-perennial stream



Figure 19: Open spaces site with low ceramic distributions near Lucerne cultivating area.



Figure 20: Some of the noted ceramics



Figure 21: View of an Iron Age site presumed to be Gumanye site, the area is dominated by *Colophospermum Mopane* bushveld complex



Figure 22: Some of the ceramics and stone tool noted on site



Figure 23: A site on rocky outcrop south of the Mutamba River bank



Figure 24: Cultural material remains from the surface of the site



Figure 25: Collapsed stone walls at the bottom slope of the mountain



Figure 26: Single grave indicated by parked stones as grave dressing, located in close proximity of the traversing Pylons



Figure 27: View of an Iron Age site near Mutamba River bank



Figure 28: Some of the cultural materials remains noted on site



Figure 29: The site is situated at the foot of the mountain, consist of livestock enclosure and scattered ceramics.



Figure 30: Low scattered undiagnostic ceramics

10. Heritage resources in the development footprint

a. Palaeontological heritage

The palaeontological field assessment found no fossil sites in the proposed development footprint. However, because of the presence of fossil sensitive geological formations (Madzaringwe and Mikandeni Formations), monitoring is essential should these potential palaeontological heritage bearing levels be exposed during mining.

b. Archaeological and historical heritage resources including burials

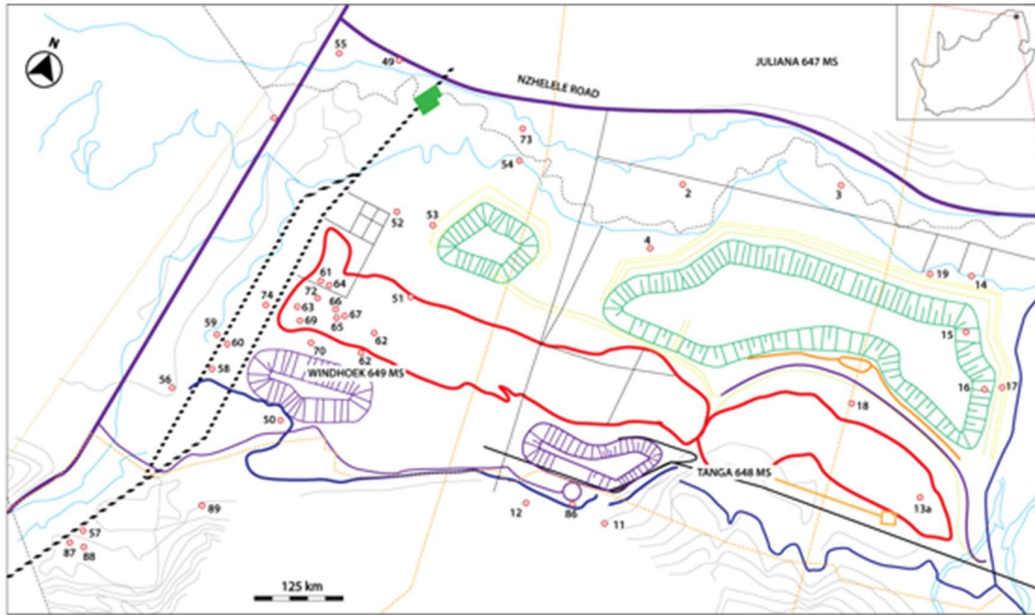


Figure 31: Map of the proposed development in relation to identified sites

Figure 31 shows that 15 sites will be directly affected by the proposed development. This include three burials (sites 65, 66, 67). These cannot be saved and must be relocated following consultation. There are sites (58, 60, and 74) that occurred alongside the Mutamba River bank that are currently not affected by the proposed open pit. Subsequent shifting of the existing Pylons and access gravel road that transverse under power lines will have negative effects. Sites other than burials must be mitigated as they are all of a lowly Field Rating III. However, the outcome information has potential to illuminate the Middle and Later Iron Age lifeways in this area.

11. Conclusion and recommendations

In conclusion, and within limitations, the study established that there are heritage sites dating to different periods in the proposed development area. The study reached the following conclusions:

- ✓ Although the proposed area for development is situated in an area that is both highly and lowly sensitive for fossils, no fossils were found on the farms Windhoek 649 MS and Tanga 648 MS.
- ✓ The assessment confirmed the existence of archaeological sites reported during the first study.

- ✓ A reassessment of significance found that some sites on the proposed development footprint had potential to add more information to the history of farming communities in northern South Africa.
- ✓ Stone tools were observed on eroded waterways and appear mostly out of context.
- ✓ The study also confirmed the presence of three graves on the proposed site for development. It is not possible to avoid these during development.

Based on these conclusions, the following recommendations were reached:

- ❖ The identified sites found in the proposed development footprint must be subjected to Phase 2 studies
- ❖ Following community consultation and engagement, the graves must be relocated, from the development footprint
- ❖ Ground disturbing activities that cut across rocks the fossil rich Madzaringwe Formation geological strata must be monitored for fossils
- ❖ A Heritage Management Plan must be developed to protect sites outside development footprint, including sacred heritage places.

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