

# HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for a  
PROPOSED NEW MUTSHO POWER PROJECT  
NEAR MAKHADO

**Prepared by**



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**In Association with Savannah Environmental**

**April 2018**



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**THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST  
PROCESS**

I Kathryn Smuts, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

**Signature of the specialist**

CTS Heritage

**Name of company**

26/06/2017

**Date**



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**EXECUTIVE SUMMARY**

Mutsho Power (Pty) Ltd proposes the development of a new coal-fired power plant and associated infrastructure on a site near Makhado (Louis Trichardt), in the Limpopo Province. The proposed development footprint may impact on the Farms Vrienden 589 and Du Toit 563. Numerous heritage resources have been identified on these properties in this, and in previous, heritage impact assessments. As such, the development of the proposed Mutsho Power Project will have permanent and irreversible impacts on the natural and cultural resources of this region. These impacts require evaluation in light of the contribution the development can make of 600 MW of electricity to the national grid.

Three layout alternatives for the power station are proposed. Alternative 1 (preferred) will have a limited impact on known heritage resources, only impacting two archaeological stone flakes and one modern farmhouse during the Construction Phase. No impacts are anticipated during the Operational Phase. The Construction Phase of Alternative 2 will have no impact to known heritage resources, however impacts to a significant living heritage site, the “Baobab Room” are likely during the Operational Phase of Alternative 2. Alternative 3 will have the greatest impact to known heritage resources during both the Construction and Operational Phases of development.

In summary, it is recommended that:

- Site V04, on Farm Vrienden 589, must not be impacted by any proposed development. A buffer of 100m around this site must be implemented.
- Graves at MOP112, on Farm Vrienden 589, must be avoided. A fence should be erected 5m from the three visible graves, and a buffer of 15m around the fence line must be observed.
- The structure at MOP114, on Farm Vrienden 589, must be avoided. A buffer of 25m around this site must be implemented.
- Sites D04 to D07, on Farm Du Toit 563, likely represents one large MSA artefact manufacturing site and must not be impacted by any proposed development. A buffer of 100m around this large artefact manufacturing site must be implemented.
- Graves at MOP033, on Farm Du Toit 563, must be avoided, and a buffer of 15m around the existing fence line must be observed.
- The structure at MOP034, on Farm Du Toit 563, must be avoided. A buffer of 25m around this site must be implemented.
- A management plan for potential impacts to Site V04, the “Baobab Room” and buried heritage resources be drafted as part of the EMP, including a Fossil Finds Procedure (please see attached example from the Western Cape as Appendix 5)
- Should any buried heritage resources be uncovered during the construction or operational phases, work must cease and SAHRA must be contacted to advise on the best way to proceed.



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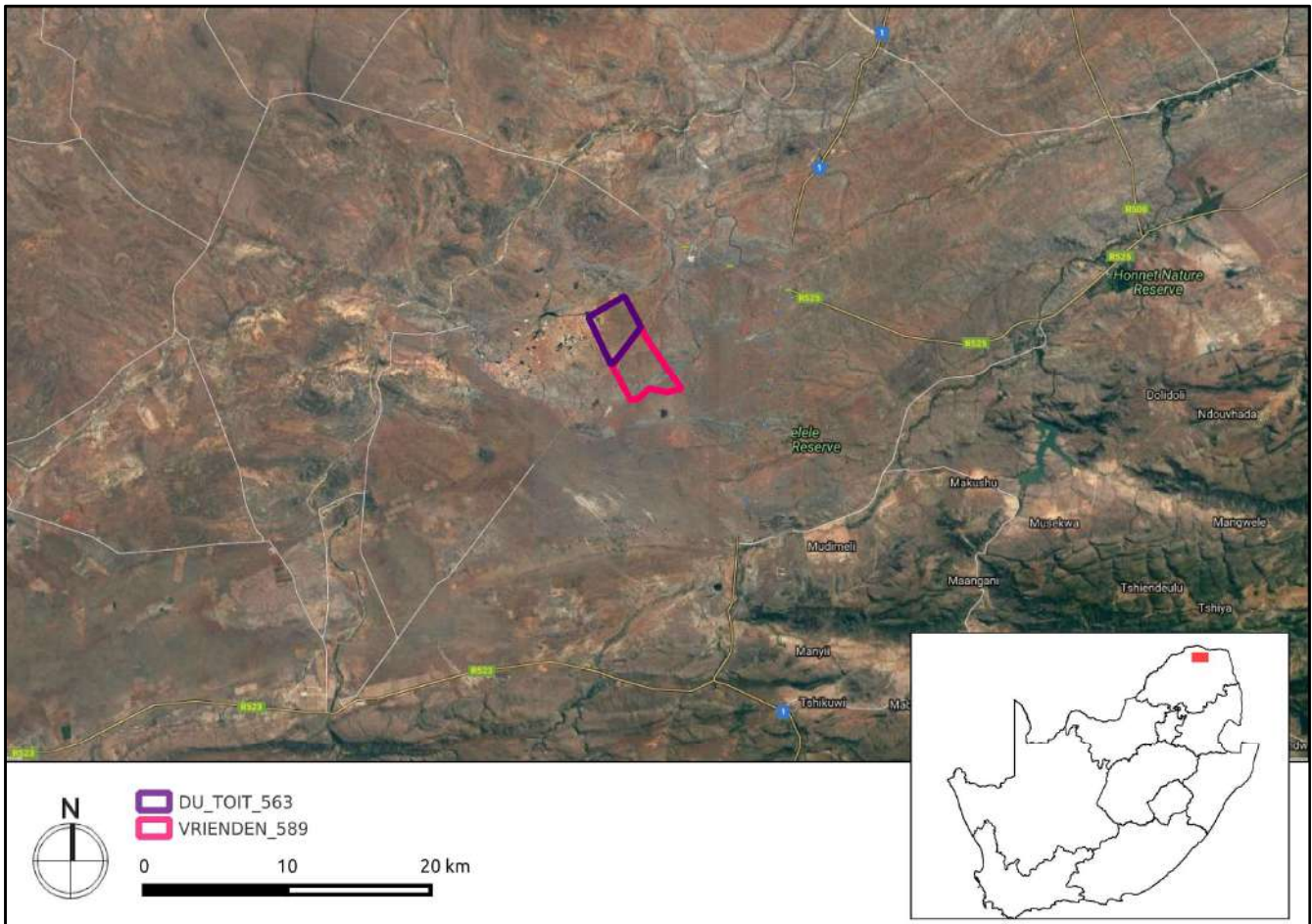
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## 1. INTRODUCTION

### 1.1 Background Information on Project

Savannah Environmental has been tasked with conducting an Environmental Impact Assessment for the proposed New Muntsho Power Project near Makhado in the Limpopo Province. Two Farms have been identified as possible alternatives for the location of this proposed power station, Farm Vrienden 589 and Farm Du Toit 563 (Figures 1 and 2).



**Figure 1: Location of the proposed development site**

Mutsho Power (Pty) Ltd proposes the development of a new coal-fired power plant and associated infrastructure on a site near Makhado (Louis Trichardt), in the Limpopo Province. The power plant will utilise coal mined at the Makhado Colliery (roughly 20km south-east of the project site), to be developed and operated by MC Mining Ltd (MCM) (previously known as Coal of Africa Limited (CoAL)), to fuel its operations. Once developed, the power plant is intended to form part of the Department of Energy's (DoE's) Coal Baseload Independent Power Producer (IPP) Procurement Programme (CBIPPPP). The project would have a generation capacity of up to 660MW (export capacity below 600MW in line with DoE requirements), and will make use of Circulating Fluidised Bed (CFB) technology.



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The project would typically comprise of the following key components and associated infrastructure:

Power island consisting of:

- Circulating Fluidised Bed (CFB) boiler technology.
- Electrostatic Precipitator (ESP) systems and Flue / smoke stacks.
- Direct dry (air-cooling) systems.
- Balance of plant components (incl. steam turbine and generator etc.).
- Coal and Limestone / Lime Rail Spur and / or Road off-loading Systems.
- Upgrading or establishment of a rail siding.
- Coal crusher and raw material handling equipment.
- Strategic and Working Coal stockpiles.
- Limestone or Lime storage and handling area.
- Ash dump (dry-ashing is proposed in order to reduce the project's water requirements, which is in alignment with the recommendations of the National Development Plan (NDP) and Integrated Energy Plan (IEP)).

Water infrastructure. This includes:

- Raw water storage dams.
- Water supply pipelines and booster stations.
- Pollution control dam/s.
- Water treatment plant (WTP).
- Wastewater treatment plant (WWTP).
- Storm water management systems.

HV Yard and substation components with HV overhead transmission lines connecting to the Eskom infrastructure.

Control room, office / administration, workshop, storage and logistics buildings.

Upgrading of external roads and establishment of internal access roads.

Security fencing and lighting.

Detailed grid integration and bulk water supply options have been excluded from the current scope of work and will be assessed through separate applications for Authorisation.

A minimum footprint of approximately 350ha is required for the proposed power station and associated infrastructure. While the physical power generation components (power island), require only approximately 50ha, supporting areas for the establishment of coal and other raw material stockpiles, and an ash dump over life of plant, increase the development footprint.



## 1.2 Description of Property and affected Environment

The area proposed for the new Mutsho Power Project is predominantly rural in nature with a number of coal mines located in the vicinity. The proposed development areas are located in the Lowveld. The area consists of savannah drylands as well as high rainfall areas. The nearby Soutpansberg has forests where the fauna and flora are abundant, and where a wide variety of animal as well as bird species can be found. The two farms both display evidence of agricultural activity and disturbance.

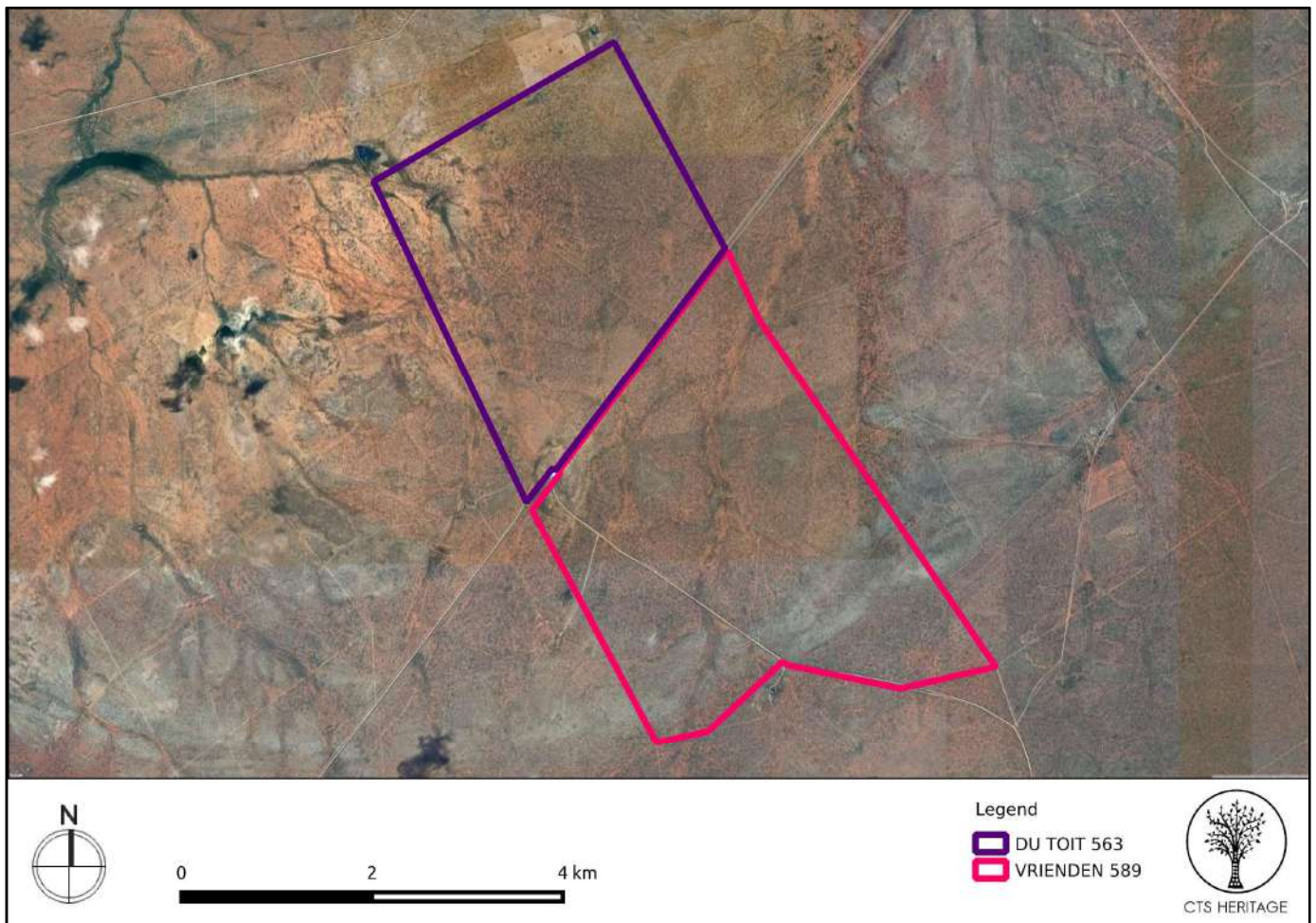


Figure 2: Farm Vrienden 589 and Farm Du Toit 563, Limpopo Province

## 2. METHODOLOGY

### 2.1 Purpose of HIA

The purpose of this Heritage Impact Assessment (HIA) is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).



## 2.2 Summary of steps followed

- A desktop study (Heritage Screener, Appendix 1) was conducted for the three farms as part of a preliminary Environmental Site Screening Assessment
- An archaeologist was contracted to conduct a survey of archaeological resources likely to be impacted by the proposed development (Archaeological Field Assessment, Appendix 2)
- A palaeontologist was contracted to conduct a survey of palaeontological resources likely to be impacted by the proposed development (Palaeontological Impact Assessment, Appendix 3)
- The identified resources were mapped and assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were identified for inclusion in the Environmental Management Programme (EMPr)

## 3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

### 3.1 Definition of the property

The proposed development is located near Makhado (Louis Trichardt), in the Limpopo Province on Farm Vrienden 589 and Farm Du Toit 563

### 3.2 Geology, geomorphology, climate and vegetation

The area proposed for development falls within the summer rainfall region of South Africa, and has a mild, subtropical climate

The study area lies within a region of variable geology that includes sediments of the:

- Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation; and
- the Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement.

Fossil heritage could be present in the Undifferentiated Karoo as well as the Solitude Formation which has a high to very high Palaeontological Sensitivity. The Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group is metamorphic rocks which is unfossiliferous and with a very low palaeontological sensitivity. The farm Du Toit 563 is entirely underlain by the Undifferentiated Karoo and the Solitude Formation. The north eastern part of the farm Vrienden 589 falls in the potentially fossiliferous Undifferentiated Karoo and the unfossiliferous Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group.



### 3.3 Archaeological and Historical Background of the Makhado/Musina region

The area surrounding the two farms proposed for this development are known for a variety of kinds of heritage resources including Stone Age and Iron Age archaeology, significant structures and living heritage sites such as significant baobab trees as well as burial grounds and graves.

South Africa has an extensive stone age archaeological record including Earlier Stone Age (approximately 2.5mya to 200 kya), Middle Stone Age (200 kya to 40 kya) and Later Stone Age (40 kya to 2000 years ago) deposits. These sites tend to present as scatters of stone age artefacts. Rarely, archaeologists may find a stone tool manufacture site with evidence of stone flake tools as well as the flaked pieces of stone. Later Iron Age sites, such as Mapungubwe, tend to present as the remnants of Iron Age settlements identified through distinct patterns of stone features that formed the foundations of iron age structures. Often, Early Iron Age sites are not visible on the surface, but are evidenced by material culture associated with the Early Iron Age such as pottery sherds, Iron slag and other material culture located beneath the land surface.

There are numerous informal burial grounds and graves located in this area, associated with farm workers or mine workers. Often these burial grounds are not fenced and have minimal surface markings denoting their presence. These informal burial grounds and graves have a significant role to play in terms of the cultural continuity of residents of the area and care must be taken to avoid any impact to sites such as this.

A previous survey of this area identified several heritage resources across the two farms (Table 1), of these, four are of sufficiently high heritage significance to be singled out here. These sites are MOP034 (SID 37459) on Farm Du Toit 563, a collapsed farm house built before 1914, and MOP114 (SID37567) on Farm Vrienden 589, the partially collapsed ruins of a formerly whites only school building, as well as two burial sites, MOP033 (SID 37458) and MOP112 (37565). MOP033, on Farm Du Toit 563, consists of two graves with headstones; these graves are dated to the 1940s and are fenced off. MOP112, on Farm Vrienden 589, consists of between one and three graves which are marked out in rectangularly arranged stones.

**Table 1: Sites previously identified within the proposed development areas (Figure 3)**

| Site ID | Site no | Full Site Name | Site Type           | Grading    |
|---------|---------|----------------|---------------------|------------|
| 37464   | MOP035  | Mopane 035     | Deposit             | Grade IIIc |
| 37563   | MOP110  | Mopane 110     | Structures, Deposit | Grade IIIc |
| 37564   | MOP111  | Mopane 111     | Structures          | Grade IIIc |
| 37566   | MOP113  | Mopane 113     | Structures          | Grade IIIc |



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|       |        |            |                         |            |
|-------|--------|------------|-------------------------|------------|
| 37567 | MOP114 | Mopane 114 | Structures              | Grade IIIa |
| 37568 | MOP115 | Mopane 115 | Structures              | Grade IIIb |
| 37455 | MOP031 | Mopane 031 | Artefacts               | Grade IIIb |
| 37456 | MOP032 | Mopane 032 | Structures              | Grade IIIc |
| 37459 | MOP034 | Mopane 034 | Building                | Grade IIIa |
| 37466 | MOP036 | Mopane 036 | Structures              | Grade IIIc |
| 37468 | MOP037 | Mopane 037 | Building                | Grade IIIb |
| 37565 | MOP112 | Mopane 112 | Burial Grounds & Graves | Grade IIIa |
| 37458 | MOP033 | Mopane 033 | Burial Grounds & Graves | Grade IIIa |

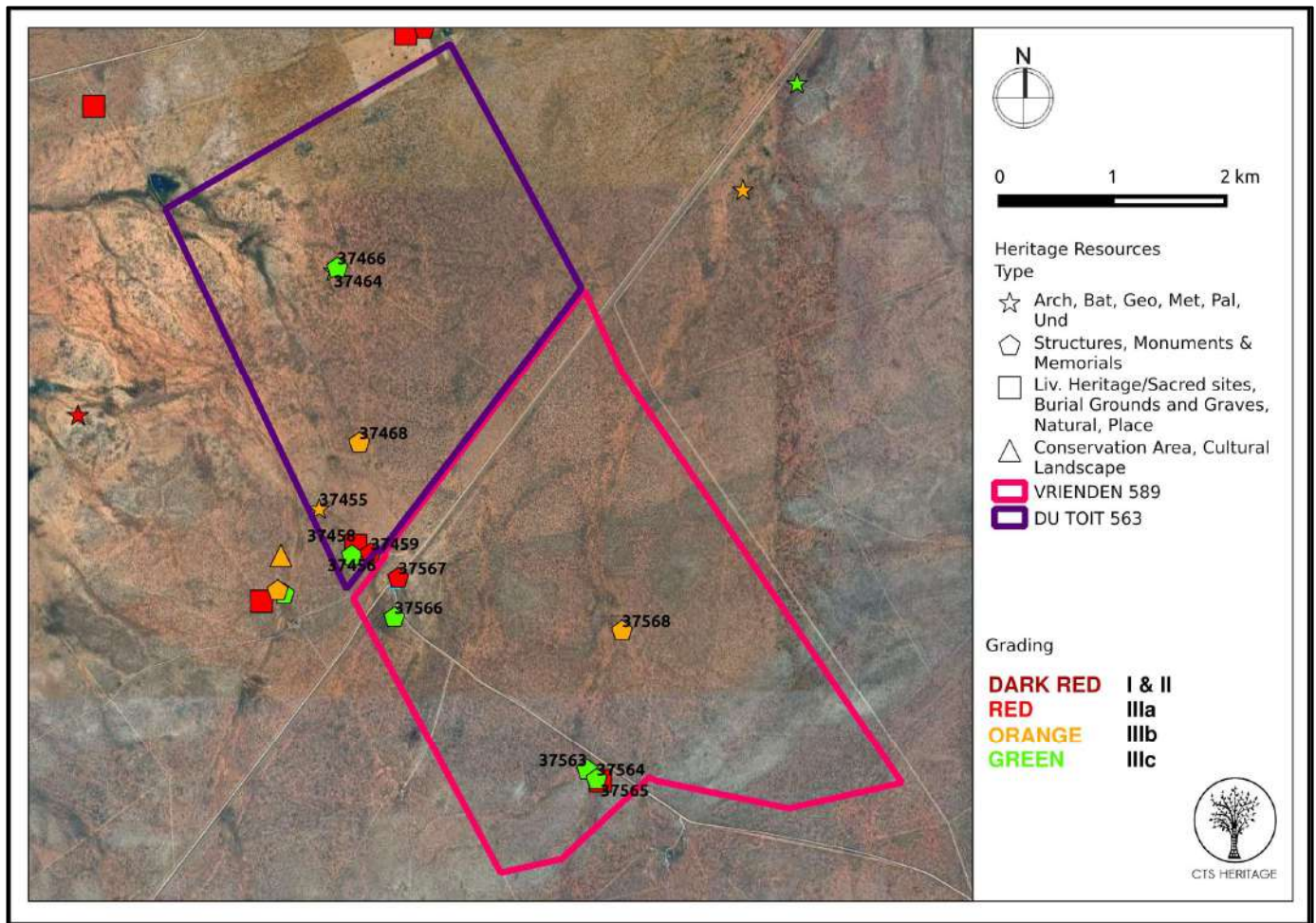


Figure 3: Spatialisation of known heritage resources in the vicinity of the proposed development

Table 2: HIAs previously conducted in the vicinity of the proposed development

| Nid | Report Type | Author/s | Date | Title |
|-----|-------------|----------|------|-------|
|-----|-------------|----------|------|-------|



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|        |     |   |            |   |
|--------|-----|---|------------|---|
| 153337 | HIA | Matodzi Silidi,<br>Innocent<br>Pikirayi | 04/10/2013 | The attached report is a Heritage Impact Assessment (HIA) for the Mopane Project Area which describes potential adverse and positive effects of the proposed mining operations on heritage resources. |
|--------|-----|---|------------|---|

#### 4. IDENTIFICATION OF HERITAGE RESOURCES

##### 4.1 Summary of findings of Specialist Reports

An archaeologist conducted a field survey from 23 January to 26 January 2017, that encompassed both Farm Vrienden 589 and Farm Du Toit 563, although movement on the former was somewhat restricted (Figure 4 and Table 4). The most significant findings from this assessment include Site V04, the Baobab Room, located on Farm Vrienden 589, and graded IIIa, and Sites D04 to D07 which appear to be a Middle Stone Age artefact manufacturing site located on Farm Du Toit 563, and were also graded IIIa (Figures 8-13).

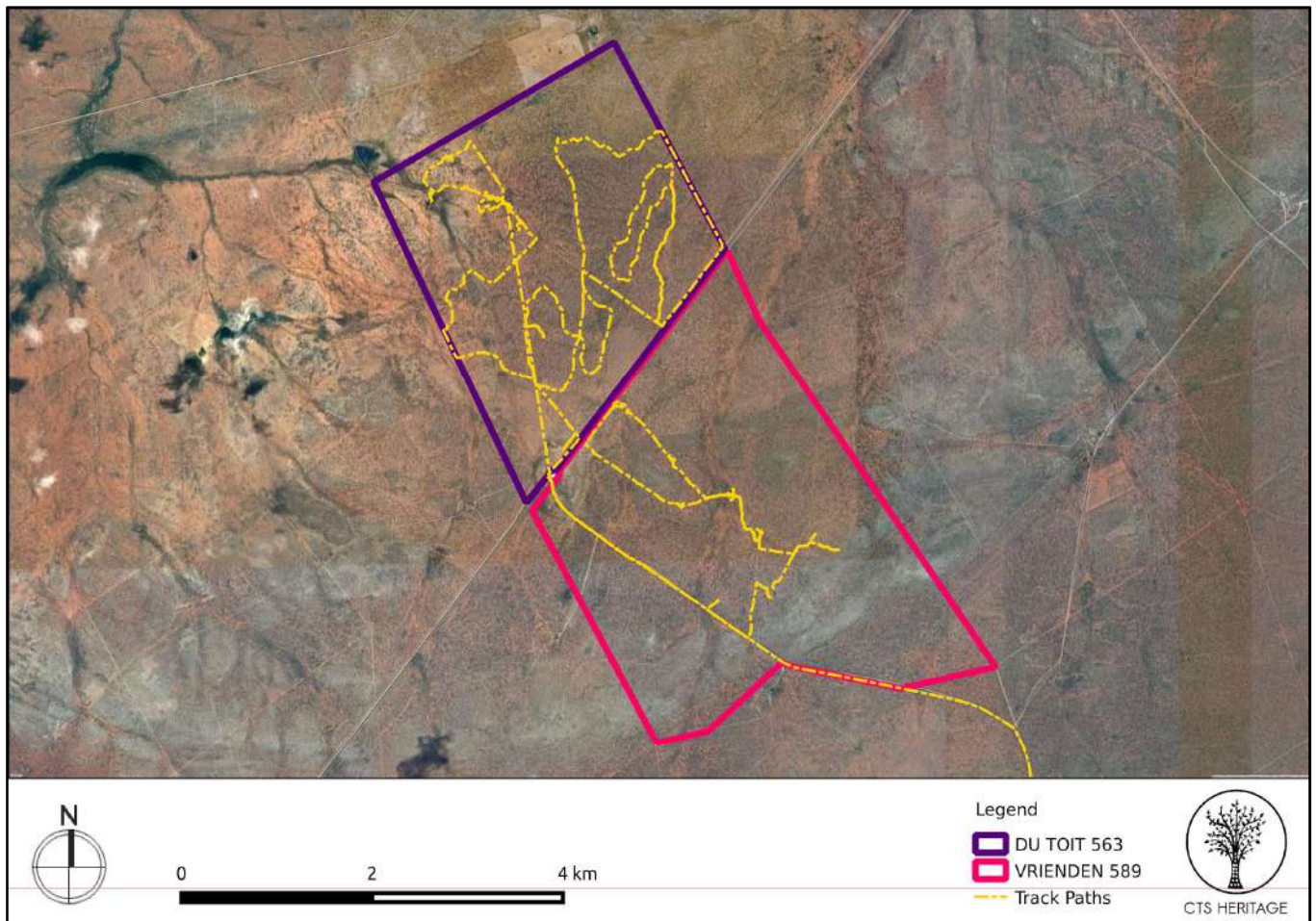


Figure 4: Track paths of archaeological survey





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The palaeontology of the two farms is notably different. Farm Du Toit 563 is underlain by deposits of high fossil sensitivity, while Farm Vrienden 589 is largely underlain by deposits of low or unknown palaeontological significance, with small areas of high sensitivity deposits in the very north of the area (Figure 5). The high sensitivity deposits include sandstones, siltstones and mudstones of the Karoo Supergroup, and Bosbokpoort, Fripp, Solitude, Klopperfontein, Madzaringwe and Mikambeni Formations. These various deposits are mostly fluvial, and are known to contain a wide variety of fossils including dinosaur remains, fossil plants and petrified wood. The low sensitivity deposits comprise gneisses, representing the Malala Drift Gneiss Suite, and metamorphic rocks of the Archean Gumbu Group, which are unfossiliferous, as well as red sandstones of an indeterminate origin.

A palaeontological field assessment identified no significant palaeontological resources within the development footprint.

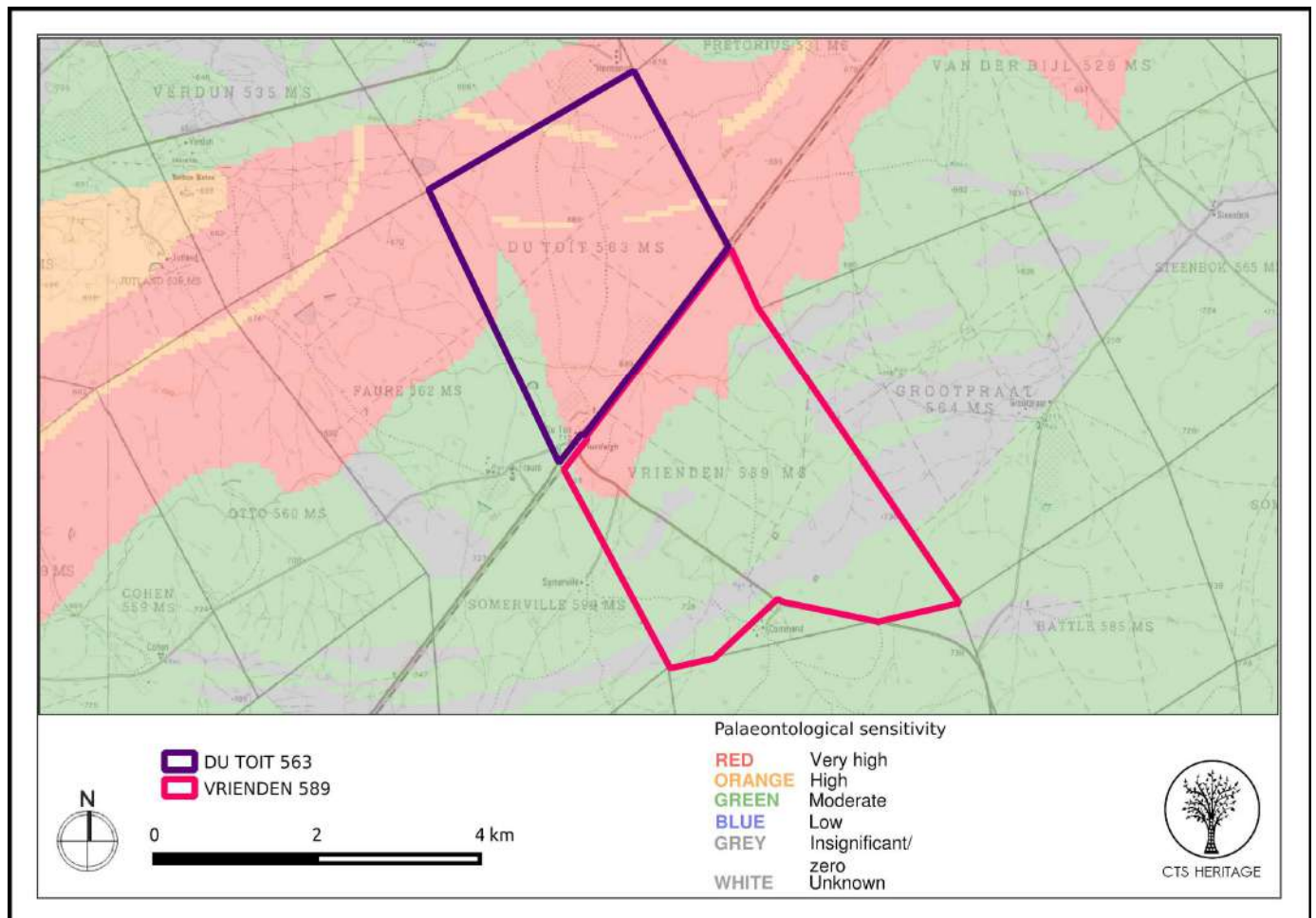


Figure 5: Palaeontological Sensitivity of the proposed development area

#### 4.2 Heritage Resources identified



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The most significant findings from this assessment include Site V04, the Baobab Room, graded IIIa on Farm Vrienden 589, and Sites D04 to D07, which for the purposes of this report should be read as one site, also graded IIIA on Farm Du Toit 563

### ***Living Heritage***

The Baobab Room, Site V04, is an interesting example of living heritage that continues to be used today (Figure 8). The baobab, which has an entirely hollow trunk at ground level, has a number of windows that allow light into the shelter provided within the trunk (Figure 9). Pegs have been hammered into the external bark to facilitate access to inside the tree through one of these windows (Figure 10). There appears to be deposit of unknown depth inside the trunk. It is proposed that this site is graded IIIa.

### ***Archaeology***

Sites D04 to D07 appear to be a Middle Stone Age artefact manufacturing site (Figures 11-13). These sites extend and blend into one another, forming one large site. The density of flakes and flaked pieces that occur within this larger site is very high, with the ground surface littered with Middle Stone Age artefacts and individual instances of manufacture. The highest density appears around site D06. Such open air Middle Stone Age sites are rare and provide a unique window into the origins of modern humans. It is proposed that this larger artefact manufacturing site be graded IIIA due to its high level of scientific cultural significance.

### ***Palaeontology***

A field assessment identified no fossil remains within the footprint of the proposed development area (Appendix 3).

## **4.3 Mapping and spatialisation of heritage resources**

A number of heritage resources of varied significance were identified by the archaeologist on Farms Vrienden 589 and Du Toit 563 (Figures 6, 7a and 7b). These sites included isolated archaeological artefacts, larger, coherent archaeological sites, recent agricultural infrastructure and a single living heritage site, all ranging from a IIIa grading to Not Conservation Worthy. All sites have been recorded on SAHRIS and are detailed in the table below. On both surveyed farms, the visibility was good. A number of informal dam excavations and mole rat activity provided a window into sub-surface deposits.

All sites were photographed, and their GPS location recorded. The foot survey conducted provided a good characterisation of the heritage resources in the area and the findings were consistent with that of other studies in the immediate vicinity (Table 2).



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Please see the Archaeological Field Assessment attached as Appendix 2 for more information.

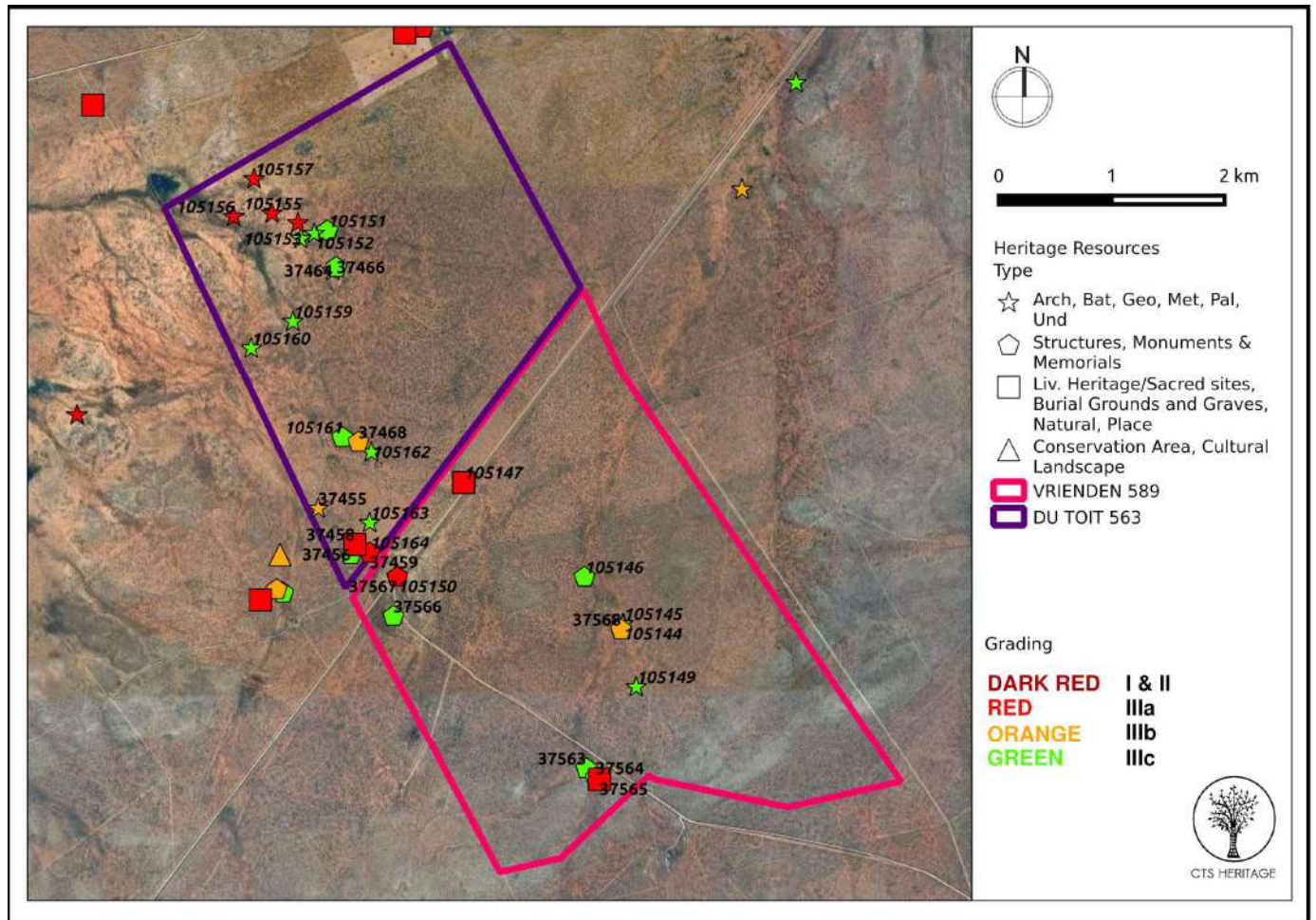


Figure 6: Spatialisation of heritage resources identified during the field assessment





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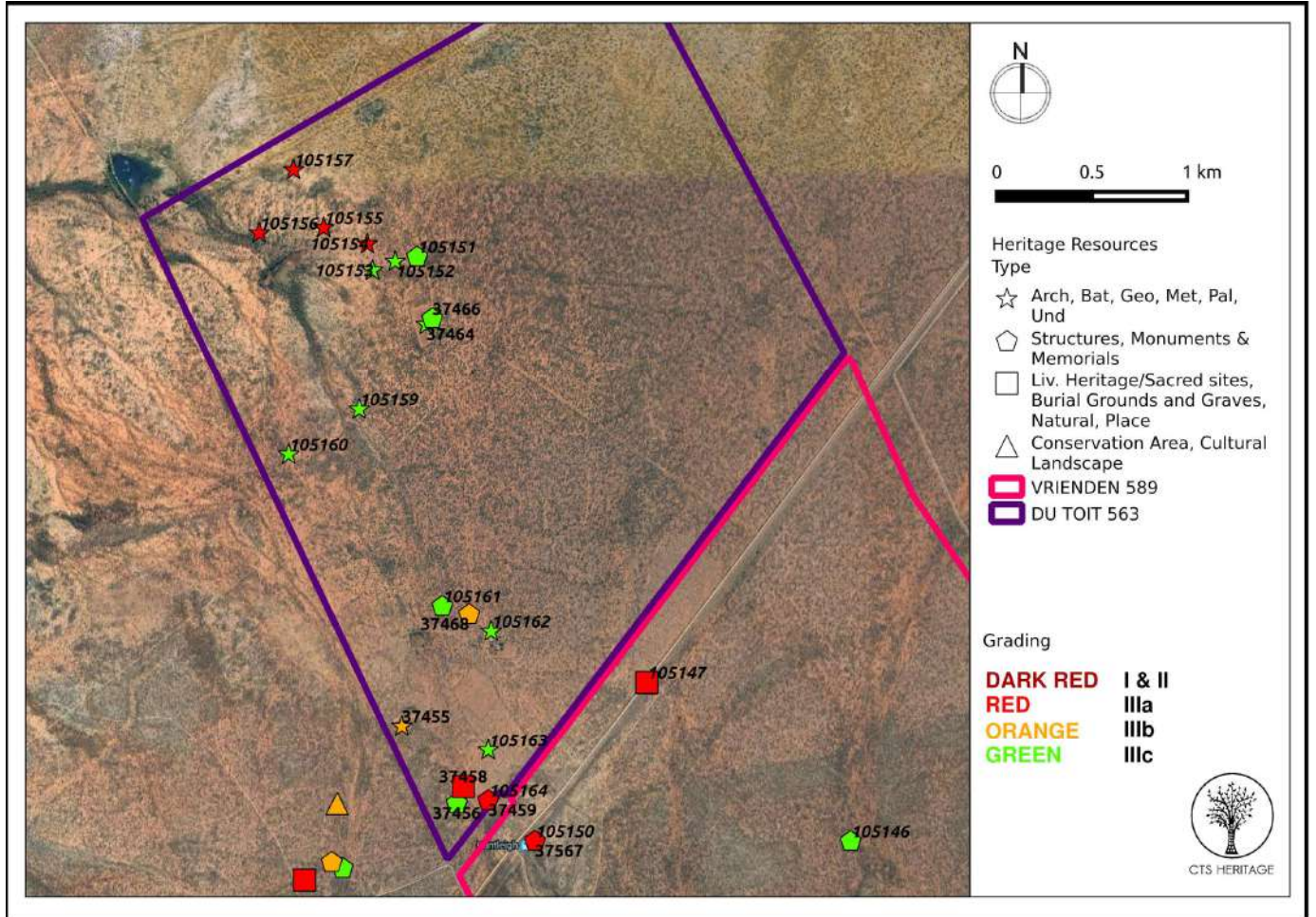


Figure 7a: Spatialisation of all known heritage resources within the Farm Du Toit 563





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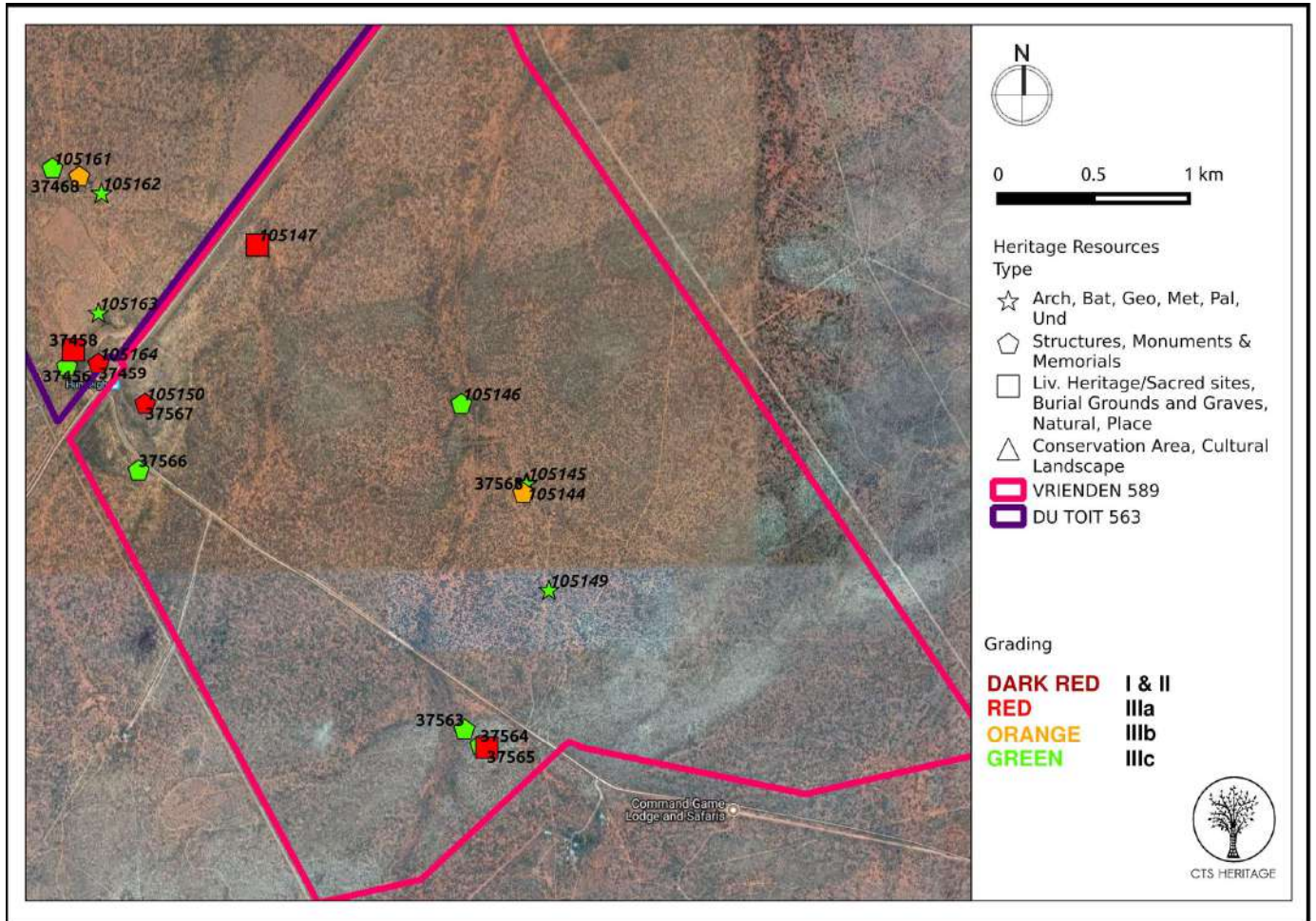


Figure 7b: Spatialisation of all known heritage resources within the Farm Vrienden 589

#### 4.4 Selected photographic record

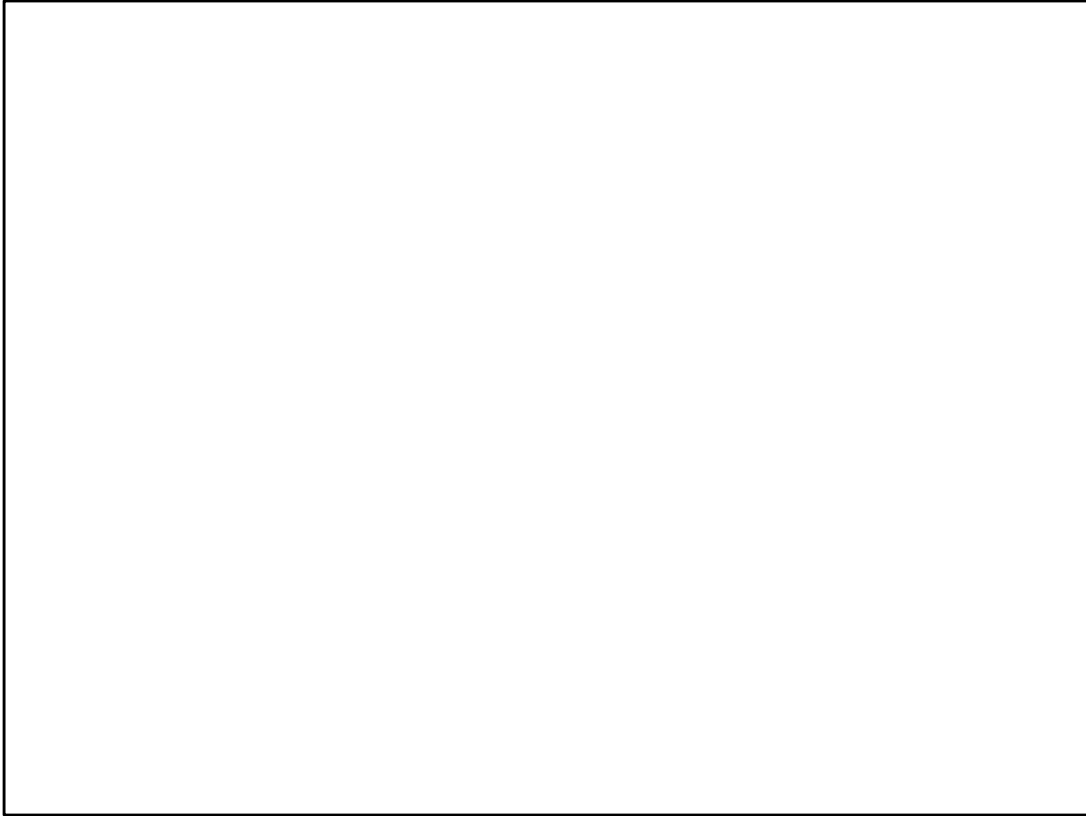


Figure 8: Site V04, the “Baobab Room”





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**Figure 12: A selection of MSA artefacts from site D04**



**Figure 13: An example of the density of artefacts at Site D06**



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**Table 4: Heritage resources identified during the foot survey**

| SAHRIS Site ID | Site Number | Site Name  | Site Description  | Grading    |
|----------------|-------------|------------|---|------------|
| 105144         | V01         | Vrienden 1 | Archaeological, 1 stone artefact  | NCW        |
| 105145         | V02         | Vrienden 2 | Archaeological, 1 stone artefact  | NCW        |
| 105146         | V03         | Vrienden 3 | Modern disused agricultural infrastructure  | NCW        |
| 105147         | V04         | Vrienden 4 | Living Heritage/Sacred sites, the "Baobab Room"   | Grade IIIa |
| 105149         | V05         | Vrienden 5 | Archaeological, 1 stone artefact  | NCW        |
| 105150         | V06         | Vrienden 6 | Ruin of agricultural infrastructure   | NCW        |
| 105151         | D01         | Du Toit 1  | Modern agricultural infrastructure  | NCW        |
| 105152         | D02         | Du Toit 2  | Archaeological, 1 potsherd  | NCW        |
| 105153         | D03         | Du Toit 3  | Archaeological, potsherd and some stone tools, low density  | Grade IIIc |
| 105154         | D04         | Du Toit 4  | Archaeological, MSA stone tools identified emerging from 1x4m hole previously dug, Additional artefacts and raw material scattered on surface. High density | Grade IIIa |
| 105155         | D05         | Du Toit 5  | Archaeological, MSA stone tools raw material scattered on surface. High density   | Grade IIIa |
| 105156         | D06         | Du Toit 6  | Archaeological, MSA stone tools raw material scattered on surface. Highest density  | Grade IIIa |
| 105157         | D07         | Du Toit 7  | Archaeological, MSA stone tools raw material scattered on surface including hammerstone. High density   | Grade IIIa |
| 105159         | D08         | Du Toit 8  | Archaeological, isolated artefacts. Low density   | Grade IIIc |
| 105160         | D09         | Du Toit 9  | Archaeological, artefacts and ochre. Moderate density   | Grade IIIc |
| 105161         | D10         | Du Toit 10 | Remains of modern disused agricultural infrastructure   | NCW        |
| 105162         | D11         | Du Toit 11 | Archaeological, small dam with sporadic artefacts in spoil heap   | Grade IIIc |
| 105163         | D12         | Du Toit 12 | Archaeological, near to the boundary of Vrienden. Area cleared for powerline construction. Piece of iron slag identified.                                   | NCW        |
| 105164         | D13         | Du Toit 13 | Ruin of disused modern agricultural infrastructure  | NCW        |



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**Table 5: All significant (Grade IIIa and IIIb) known heritage resources within the proposed development areas - to be avoided**

| SAHRIS Site ID | Site Number | Site Name  | Site Description  | Grading    |
|----------------|-------------|------------|---|------------|
| 37458          | MOP033      | Mopane 033 | Burial Grounds & Graves   | Grade IIIa |
| 37459          | MOP034      | Mopane 034 | Building  | Grade IIIa |
| 37565          | MOP112      | Mopane 112 | Burial Grounds & Graves   | Grade IIIa |
| 37567          | MOP114      | Mopane 114 | Structures  | Grade IIIa |
| 37568          | MOP115      | Mopane 115 | Structure   | Grade IIIb |
| 105147         | V04         | Vrienden 4 | Living Heritage/Sacred sites, the "Baobab Room"   | Grade IIIa |
| 105154         | D04         | Du Toit 4  | Archaeological, MSA stone tools identified emerging from 1x4m hole previously dug, Additional artefacts and raw material scattered on surface. High density | Grade IIIa |
| 105155         | D05         | Du Toit 5  | Archaeological, MSA stone tools raw material scattered on surface. High density   | Grade IIIa |
| 105156         | D06         | Du Toit 6  | Archaeological, MSA stone tools raw material scattered on surface. Highest density  | Grade IIIa |
| 105157         | D07         | Du Toit 7  | Archaeological, MSA stone tools raw material scattered on surface including hammerstone. High density   | Grade IIIa |

## 5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

### 5.1 Assessment of impact to Heritage Resources

The construction of the new Mutsho Power Project will have permanent and irreversible impacts on any heritage resources that occur within its footprint, and at 600 ha, the area of disturbance is extensive. Once the site is built, it is likely that safety and security concerns will limit the movement of people near the site, thereby reducing the likely impacts to the construction phase only.

Six examples of significant heritage resources were identified within the study area (see Table 5 above), namely the single living heritage site (V04, SID 105147), three structures (MOP034, SID 37459; MOP114, SID 37567 and MOP115, SID 37568), two grave sites (MOP033, SID 37458; MOP112, SID 37565) and the artefact manufacturing site (D04-07, SIDs 105154-105157).

Three alternatives are proposed, each with a slightly different impact to heritage resources identified. Please see the relevant maps below.





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## 5.2 Sustainable Social and Economic Benefit

Socio-economic benefits will be addressed in the EIA documentation.

## 5.3 Proposed development alternatives

### ALTERNATIVE 1 (PREFERRED):

This alternative will impact one site MOP115 (SID 37568), graded IIIb, and two stone artefacts that have been described as Not Conservation-Worthy directly. Should this Alternative proceed, MOP115 would need to be demolished. According to SAHRIS, MOP115 is a **modern** gabled building situated in an open flat area with a baobab and garden trees and shrubs. As this structure is modern, its heritage significance lies not in its fabric, but in its contribution to the cultural landscape. No section 34 permit application is required for its demolition. Therefore no significant heritage resources will be impacted by this proposed alternative.

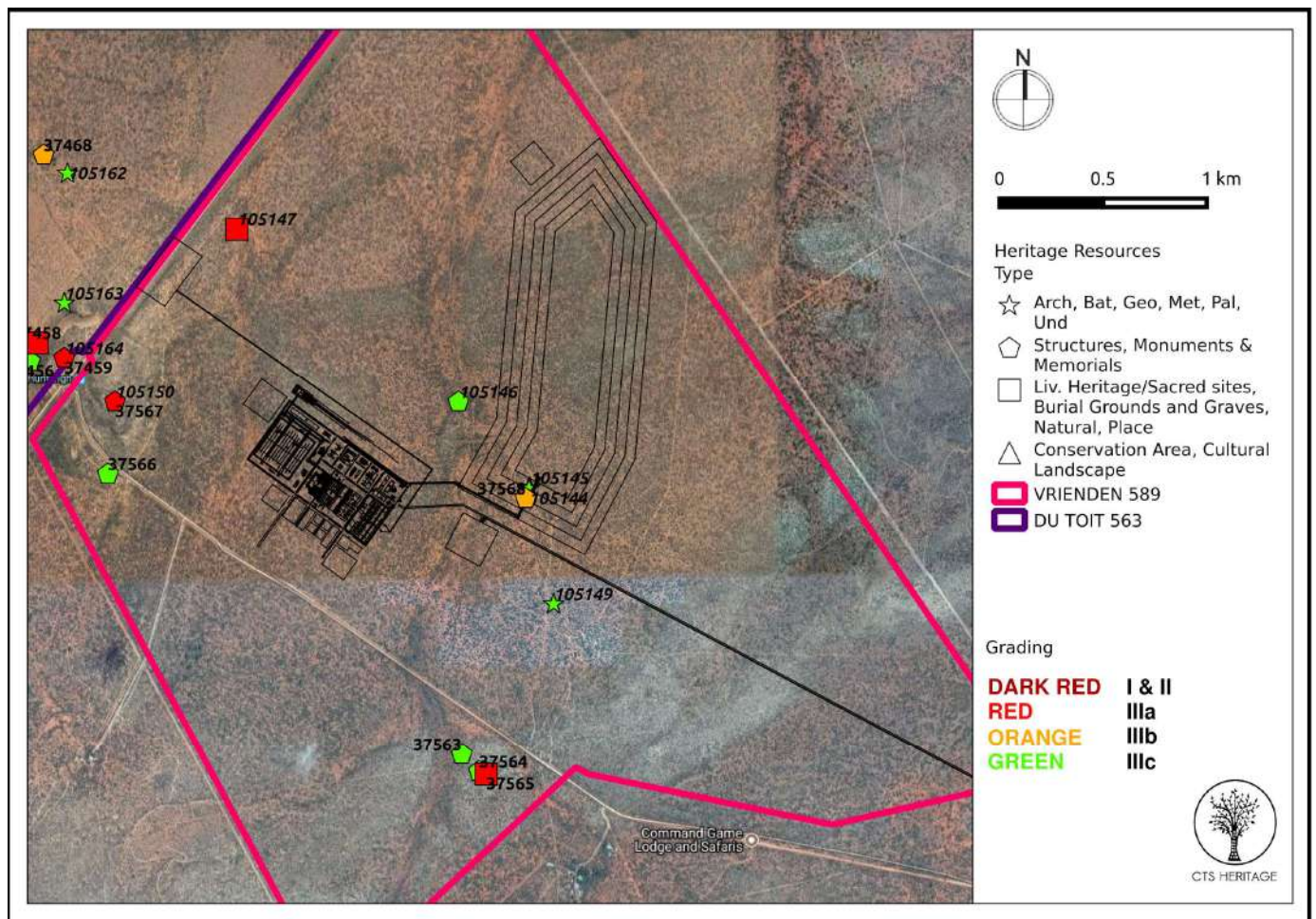


Figure 14: Impacts to known sites by the preferred alternative.



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**ALTERNATIVE 2:**

This alternative will not directly impact on any known heritage resources, and it provides a sufficient buffer of more than 100m around site Vrienden 04 (SID 105147), the “Baobab Room” (Figure 16). However, despite the proposed buffer, this Alternative is likely to have indirect impacts on the “Baobab Room” site and is therefore not preferred from a heritage perspective.

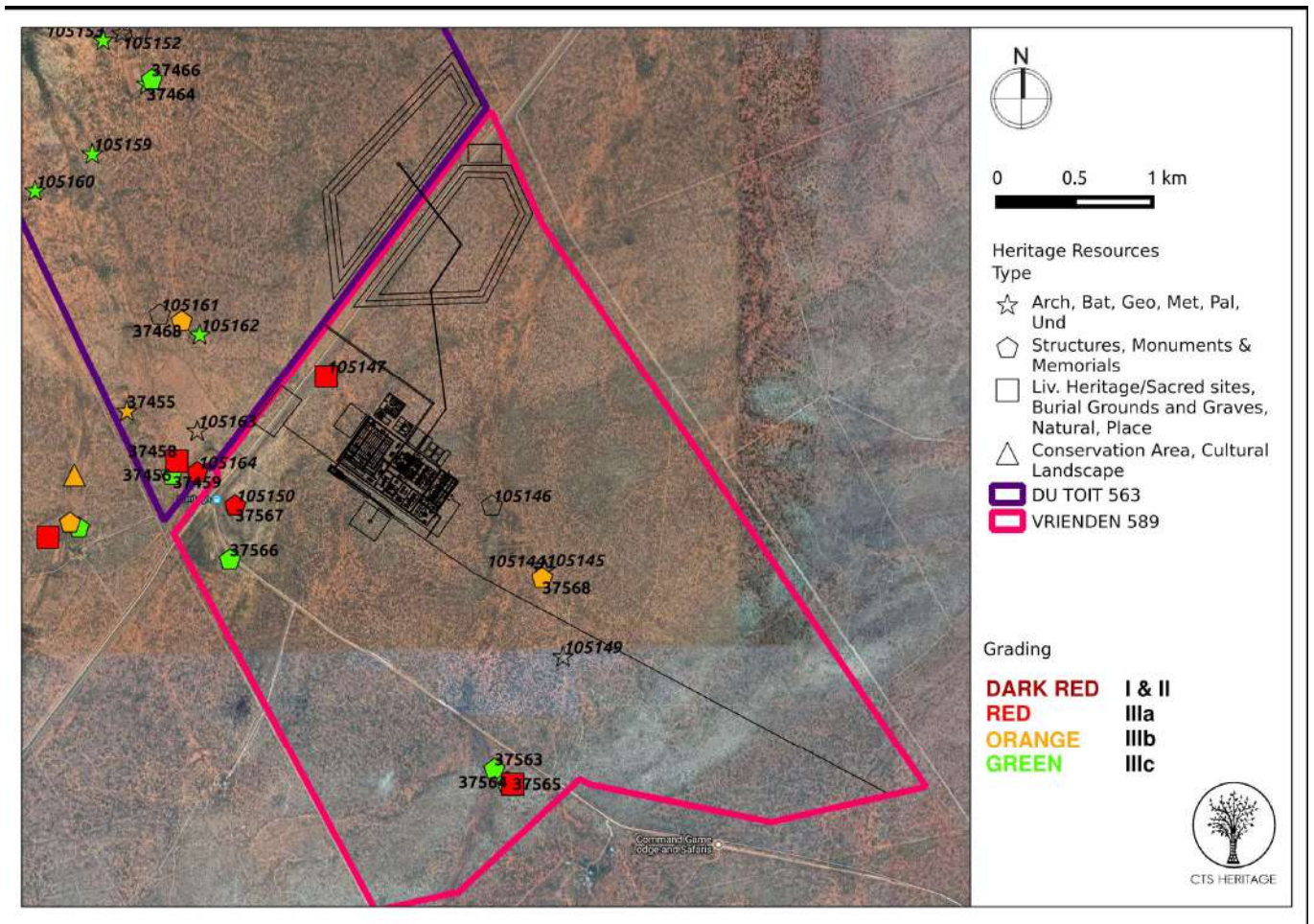


Figure 15: Impacts to known sites by Alternative 2.





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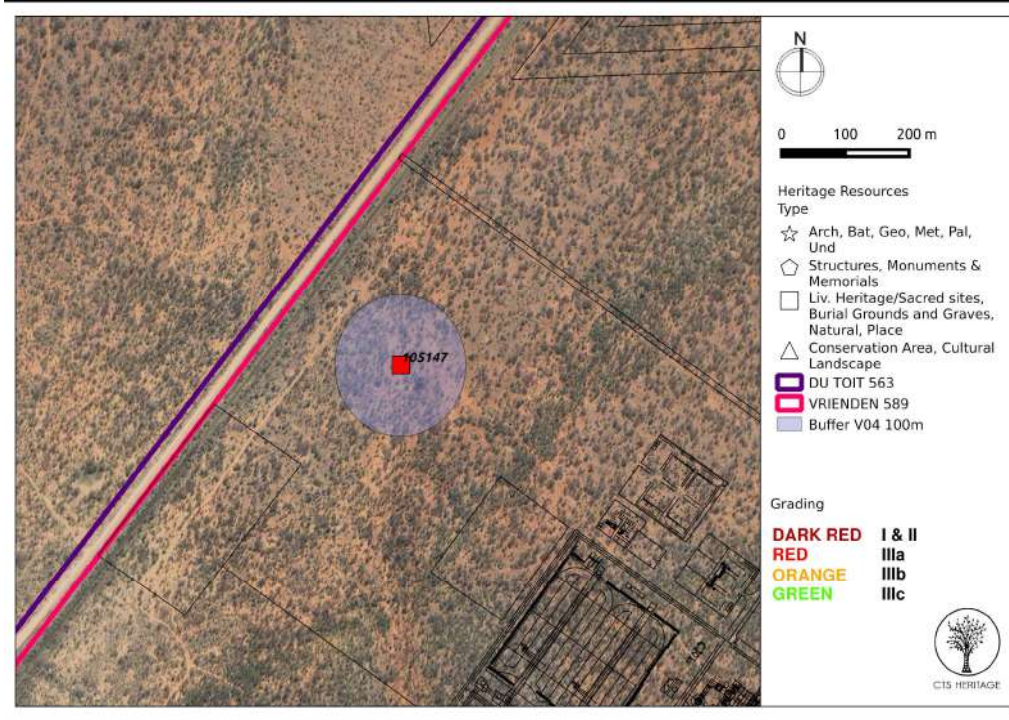


Figure 16: Impacts to known sites by Alternative 2.

### ALTERNATIVE 3 (LEAST PREFERRED):

This alternative does impact on the very significant site Vrienden 04 (SID 105147), the “Baobab Room”. Insufficient buffer space is provided around the site (Figure 18).

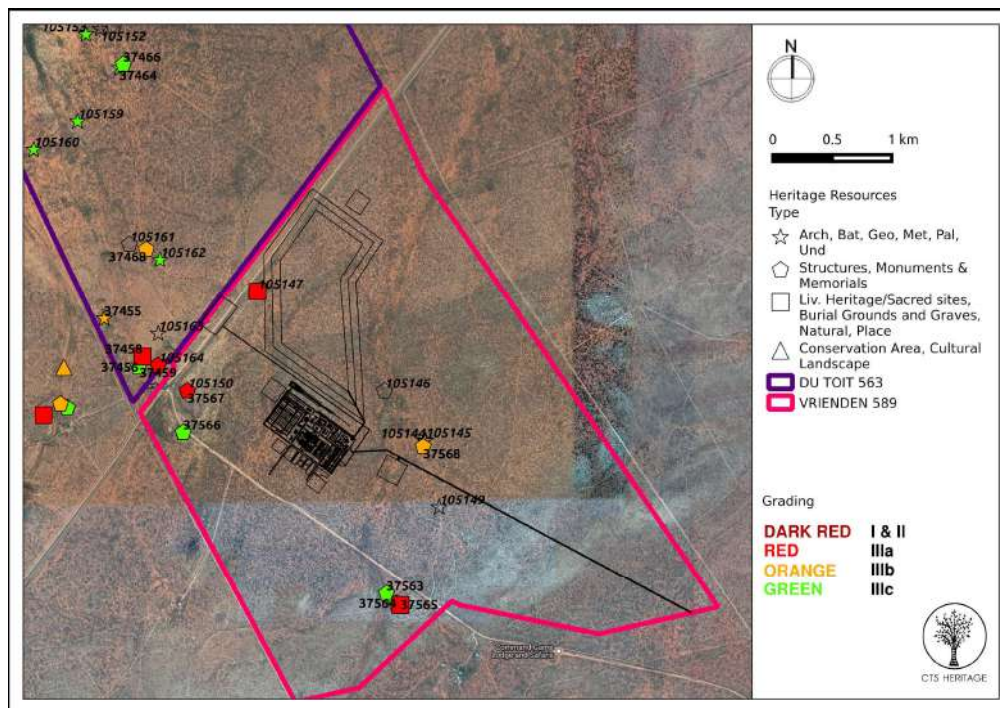


Figure 17: Impacts to known sites by Alternative 3.





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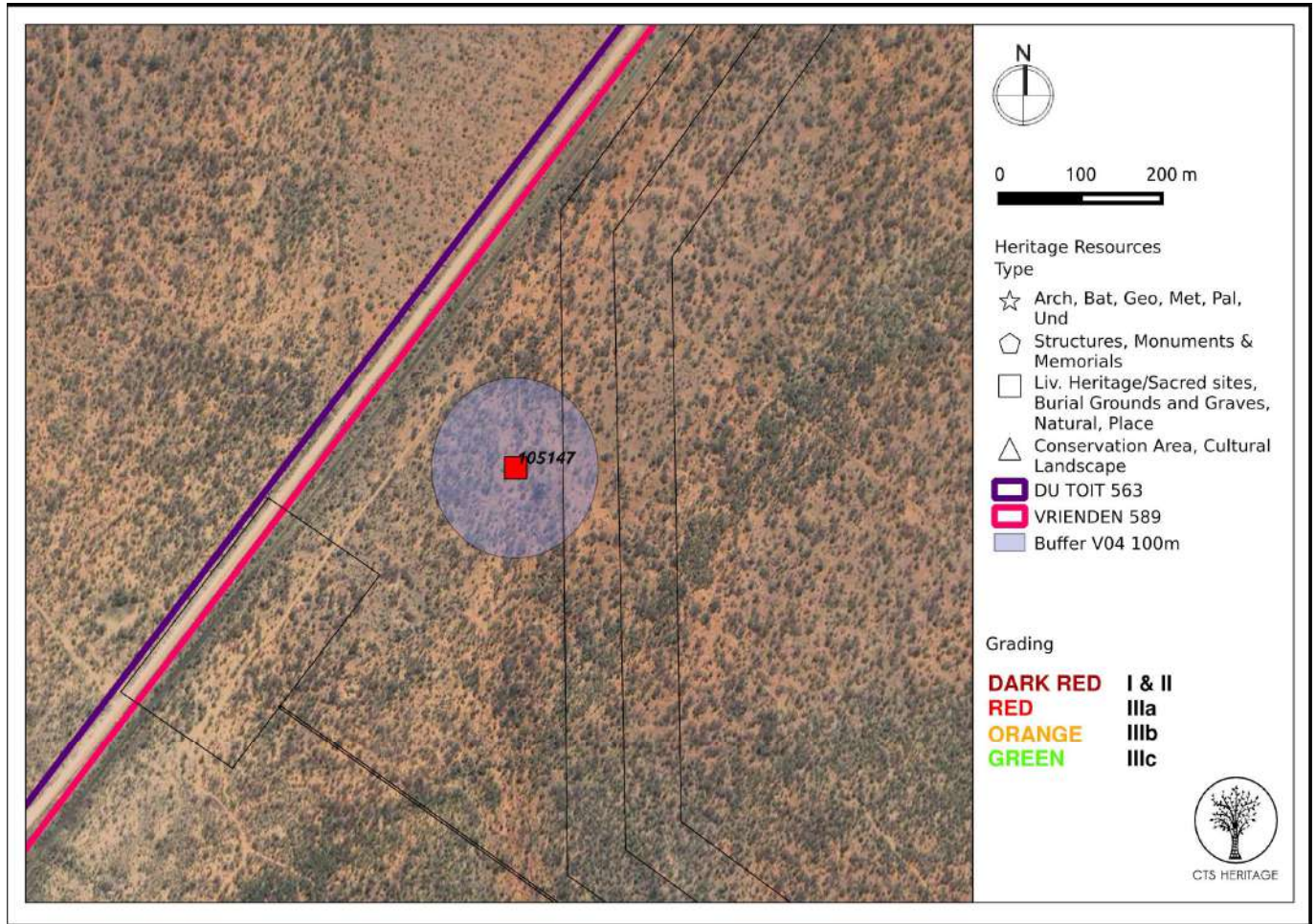


Figure 18: Impacts to known sites by Alternative 3.

The potential impacts are tabulated below. No impacts are anticipated during the Decommissioning Phase and as such, no tables have been provided for this phase.

Table 6: Summary of the potential impacts of the proposed development (Alternative 1) during the Construction Phase.

| <b>Nature:</b>   |                    |                 |
|--|--------------------|-----------------|
| The construction of Alternative 1 (preferred) will directly impact on, and destroy, archaeological sites that have been identified as Not Conservation-Worthy and sites contributing to the cultural landscape, including those identified as part of the archaeological assessment, and those as yet unidentified, or located subsurface. Palaeontological resources are unlikely to be impacted. |                    |                 |
|  | Without Mitigation | With Mitigation |
| Extent   | Local (1)          | Local (1)       |
| Duration   | Permanent (5)      | Permanent (5)   |
| Magnitude  | Low (4)            | Low (4)         |



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|   |              |              |
|---|--------------|--------------|
| <b>Probability</b>  | Definite (5) | Definite (5) |
| <b>Significance</b>   | Medium       | Medium       |
| <b>Status (positive or negative)</b>  | Negative     | Negative     |
| <b>Reversibility</b>  | None         | None         |
| <b>Irreplaceable loss of resources?</b>   | Yes          | Yes          |
| <b>Can impacts be mitigated?</b>  | No           | No           |
| <b>Mitigation:</b><br>The impacts for this alternative are to archaeological resources that are not conservation-worthy and therefore do not require any mitigation. Impacts to the cultural landscape through the demolition of the structure at MOP115 speak to the changing nature of this landscape from agricultural to industrial. No mitigation is possible. |              |              |
| <b>Residual Risks:</b><br>Impact to unknown or buried heritage resources. Indirect impacts to other known heritage resources.   |              |              |

**Table 7: Summary of the potential impacts of the proposed development (Alternative 1) during the Operational Phase.**

|   |                           |                        |
|---|---------------------------|------------------------|
| <b>Nature:</b><br>The operational phase of Alternative 1 (preferred) will have no impact on any archaeological, palaeontological or living heritage resources.                        |                           |                        |
|   | <b>Without Mitigation</b> | <b>With Mitigation</b> |
| <b>Extent</b>   | Local (1)                 | Local (1)              |
| <b>Duration</b>   | Short (1)                 | Short (1)              |
| <b>Magnitude</b>  | Small (0)                 | Small (0)              |
| <b>Probability</b>  | Improbable (1)            | Improbable (1)         |
| <b>Significance</b>   | Low                       | Low                    |
| <b>Status (positive or negative)</b>  | Neutral                   | Neutral                |
| <b>Reversibility</b>  | None                      | None                   |
| <b>Irreplaceable loss of resources?</b>   | No                        | No                     |
| <b>Can impacts be mitigated?</b>  | No                        | No                     |
| <b>Mitigation:</b><br>It is recommended that a management plan for potential impacts to buried heritage resources be drafted as part of the EMPr, including a Fossil Finds Procedure. |                           |                        |
| <b>Residual Risks:</b><br>Impact to unknown or buried heritage resources. Indirect impacts to other known heritage resources.   |                           |                        |



**Table 8: Summary of the potential impacts of the proposed development (Alternative 2) during the Construction Phase**

|  |                           |                        |
|--|---------------------------|------------------------|
| <b>Nature:</b><br>The construction of Alternative 2 will not impact on any known heritage resources, and it provides a sufficient buffer of more than 100m around site Vrienden 04 (SID 105147), the “Baobab Room” (Figure 16) for direct impacts.   |                           |                        |
|  | <b>Without Mitigation</b> | <b>With Mitigation</b> |
| <b>Extent</b>  | Local (1)                 | Local (1)              |
| <b>Duration</b>  | Permanent (5)             | Permanent (5)          |
| <b>Magnitude</b>   | Small (0)                 | Small (0)              |
| <b>Probability</b>   | Improbable (1)            | Improbable (1)         |
| <b>Significance</b>  | Low                       | Low                    |
| <b>Status (positive or negative)</b>   | Neutral                   | Neutral                |
| <b>Reversibility</b>   | None                      | None                   |
| <b>Irreplaceable loss of resources?</b>  | No                        | No                     |
| <b>Can impacts be mitigated?</b>   | No                        | No                     |
| <b>Mitigation:</b><br>None. Impacts to the cultural landscape through the establishment of the power station speak to the changing nature of this landscape from agricultural to industrial. No mitigation is possible. It is recommended that a management plan for potential impacts to buried heritage resources be drafted as part of the EMP, including a Fossil Finds Procedure. |                           |                        |
| <b>Residual Risks:</b><br>Impact to unknown or buried heritage resources. Indirect impacts to other known heritage resources.  |                           |                        |

**Table 9: Summary of the potential impacts of the proposed development (Alternative 2) during the Operational Phase**

|   |                           |                        |
|---|---------------------------|------------------------|
| <b>Nature:</b><br>The operational phase of Alternative 2 may impact indirectly on site Vrienden 04 (SID 105147), the “Baobab Room” (Figure 16) as a result of increased activity in the vicinity. |                           |                        |
|   | <b>Without Mitigation</b> | <b>With Mitigation</b> |
| <b>Extent</b>   | Local (1)                 | Local (1)              |
| <b>Duration</b>   | Long Term (4)             | Long Term (4)          |
| <b>Magnitude</b>  | Very High (10)            | Moderate (6)           |
| <b>Probability</b>  | Highly probable (4)       | Improbable (2)         |
| <b>Significance</b>   | High                      | Low                    |
| <b>Status (positive or negative)</b>  | Negative                  | Negative               |



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|  |      |      |
|--|------|------|
| <b>Reversibility</b>   | None | None |
| <b>Irreplaceable loss of resources?</b>  | No   | No   |
| <b>Can impacts be mitigated?</b>   | Yes  | Yes  |
| <b>Mitigation:</b><br>It is recommended that a management plan for potential impacts to the “Baobab Room” and buried heritage resources be drafted as part of the EMP, including a Fossil Finds Procedure. |      |      |
| <b>Residual Risks:</b><br>Impact to unknown or buried heritage resources. Indirect impacts to other known heritage resources.  |      |      |

**Table 10: Summary of the potential impacts of the proposed development (Alternative 3) during the Construction Phase**

|  |                           |                        |
|--|---------------------------|------------------------|
| <b>Nature:</b><br>The construction of Alternative 3 (least preferred) will impact on the very significant site Vrienden 04 (SID 105147), the “Baobab Room”. Insufficient buffer space is provided around the site (Figure 18).   |                           |                        |
|  | <b>Without Mitigation</b> | <b>With Mitigation</b> |
| <b>Extent</b>  | Local (1)                 | Local (1)              |
| <b>Duration</b>  | Permanent (5)             | Permanent (5)          |
| <b>Magnitude</b>   | Very High (10)            | Very High (10)         |
| <b>Probability</b>   | Definite (5)              | Definite (5)           |
| <b>Significance</b>  | High                      | High                   |
| <b>Status (positive or negative)</b>   | Negative                  | Negative               |
| <b>Reversibility</b>   | None                      | None                   |
| <b>Irreplaceable loss of resources?</b>  | Yes                       | Yes                    |
| <b>Can impacts be mitigated?</b>   | No                        | No                     |
| <b>Mitigation:</b><br>None, any impacts to the buffer zone around Site V04 will permanently and negatively impact the living heritage site. Impacts to the cultural landscape through the establishment of the power station speak to the changing nature of this landscape from agricultural to industrial. No mitigation is possible. It is recommended that a management plan for potential impacts to buried heritage resources be drafted as part of the EMP, including a Fossil Finds Procedure. |                           |                        |
| <b>Residual Risks:</b><br>Impact to unknown or buried heritage resources. Indirect impacts to other known heritage resources.  |                           |                        |

**Table 11: Summary of the potential impacts of the proposed development (Alternative 3) during the Operational Phase**

|   |
|---|
| <b>Nature:</b><br>The operational phase of Alternative 3 (least preferred) will impact on the very significant site Vrienden 04 (SID 105147), |
|---|



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the “Baobab Room”. Insufficient buffer space is provided around the site (Figure 18).

|   | Without Mitigation | With Mitigation |
|---|--------------------|-----------------|
| <b>Extent</b>   | Local (1)          | Local (1)       |
| <b>Duration</b>   | Permanent (5)      | Permanent (5)   |
| <b>Magnitude</b>  | Very High (10)     | Very High (10)  |
| <b>Probability</b>  | Definite (5)       | Definite (5)    |
| <b>Significance</b>   | High               | High            |
| <b>Status (positive or negative)</b>  | Negative           | Negative        |
| <b>Reversibility</b>  | None               | None            |
| <b>Irreplaceable loss of resources?</b>   | Yes                | Yes             |
| <b>Can impacts be mitigated?</b>  | No                 | No              |
| <b>Mitigation:</b><br>None, any impacts to the buffer zone around Site V04 will permanently and negatively impact the living heritage site. No mitigation is possible. It is recommended that a management plan for potential impacts to buried heritage resources be drafted as part of the EMP, including a Fossil Finds Procedure. |                    |                 |
| <b>Residual Risks:</b><br>Impact to unknown or buried heritage resources. Indirect impacts to other known heritage resources.   |                    |                 |

**6. RESULTS OF PUBLIC CONSULTATION**

Public consultation will take place as part of the EIA process. No heritage specific consultation has been conducted.

**7. CONCLUSION AND RECOMMENDATIONS**

Mutsho Power (Pty) Ltd proposes the development of a new coal-fired power plant and associated infrastructure on a site near Makhado (Louis Trichardt), in the Limpopo Province. The proposed development footprint may impact on the Farms Vrienden 589 and Du Toit 563. Numerous heritage resources have been identified on these properties in this, and in previous, heritage impact assessments. As such, the development of the proposed Mutsho Power Project will have permanent and irreversible impacts on the natural and cultural resources of this region. These impacts require evaluation in light of the contribution the development can make of 600 MW of electricity to the national grid.

Three layout alternatives for the power station are proposed. Alternative 1 (preferred) will have a limited impact on known heritage resources, only impacting two archaeological stone flakes and one modern farmhouse during the Construction Phase. No impacts are anticipated during the Operational Phase. The Construction



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Phase of Alternative 2 will have no impact to known heritage resources, however impacts to a significant living heritage site, the “Baobab Room” are likely during the Operational Phase of Alternative 2. Alternative 3 will have the greatest impact to known heritage resources during both the Construction and Operational Phases of development.

Irrespective of which Alternative is implemented, it is recommended that Site V04, the Baobab Room, must not be impacted by any activity and any proposed activity on this farm must adhere to a buffer area of 100m around this site. Similarly, MOP114, the ruined structure, should be avoided, and a 25m buffer placed around the site. The graves at MOP112 should be fenced, with the fence placed 5m from the visible graves, and a buffer should be instituted 15m from the fence line.

Farm Du Toit 563 has areas that are very significant in terms of archaeological resources, with sites D04 to D07 representing one large Middle Stone Age artefact manufacturing site that has high archaeological significance and valuable research potential. This site must not be impacted, directly or indirectly, by any proposed power station, and mitigation by excavation is not recommended as this would result in loss of significant archaeological information. The exact boundaries of the extent of this larger manufacturing site are not clearly determined and as such, a buffer of 100m around the visible extent of this large site be implemented for any proposed activity the close proximity to this site.

In summary, it is recommended that:

- Site V04, on Farm Vrienden 589, must not be impacted by any proposed development. A buffer of 100m around this site must be implemented.
- Graves at MOP112, on Farm Vrienden 589, must be avoided. A fence should be erected 5m from the three visible graves, and a buffer of 15m around the fence line must be observed.
- The structure at MOP114, on Farm Vrienden 589, must be avoided. A buffer of 25m around this site must be implemented.
- Sites D04 to D07, on Farm Du Toit 563, likely represents one large MSA artefact manufacturing site and must not be impacted by any proposed development. A buffer of 100m around this large artefact manufacturing site must be implemented.
- Graves at MOP033, on Farm Du Toit 563, must be avoided, and a buffer of 15m around the existing fence line must be observed.
- The structure at MOP034, on Farm Du Toit 563, must be avoided. A buffer of 25m around this site must be implemented.
- A management plan for potential impacts to Site V04, the “Baobab Room” and buried heritage resources be drafted as part of the EMP, including a Fossil Finds Procedure (please see attached example from the Western Cape as Appendix 5)





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- Should any buried heritage resources be uncovered during the construction or operational phases, work must cease and SAHRA must be contacted to advise on the best way to proceed.



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**Table 12: Tables with mitigation measures for inclusion into the EMP**

|  |  |
|--|--|
| OBJECTIVE: Drafting a Conservation Management Plan to mitigate impacts to significant heritage resources such as Site V04, any buried heritage resources as well as the identified graves. |  |
| <b>Project Component/s</b>   | Drafting CMP for submission to SAHRA for approval  |
| <b>Potential Impact</b>  | Improper management of heritage resources resulting in their destruction, including Site V04, any buried heritage resources and the identified graves. |
| <b>Activities/Risk Sources</b>   | None   |
| <b>Mitigation: Target/Objective</b>  | Effective guidance for the Operational Phase of the project to ensure that impacts to significant heritage resources are mitigated.                    |

| <b>Mitigation: Action/Control</b> | <b>Responsibility</b> | <b>Timeframe</b>  |
|-----------------------------------|-----------------------|-------------------|
| Drafting CMP                      | Heritage Consultant   | Operational Phase |

|                              |  |
|------------------------------|--|
| <b>Performance Indicator</b> | Ongoing management of significant heritage resources through implementation of the CMP |
| <b>Monitoring</b>            | SAHRA must ensure compliance with the provisions of the CMP                            |



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## 8. REFERENCES

| Impact Assessment References |             |   |            |  |
|------------------------------|-------------|---|------------|--|
| Nid                          | Report Type | Author/s                                | Date       | Title  |
| 45126                        | HIA         | Frans Roodt                             | 01/10/2011 | Eskom Power Line Paradise Substation to the Proposed Makhado Colliery  |
| 153337                       | HIA         | Matodzi Silidi,<br>Innocent<br>Pikirayi | 04/10/2013 | Heritage Impact Assessment for the Proposed Greater Soutpansberg Mopane Project                                    |
| 153366                       | HIA         | Matodzi Silidi,<br>Innocent<br>Pikirayi | 18/11/2013 | Heritage Impact Assessment for the Proposed Greater Soutpansberg Chapudi Project                                   |
| 291265                       | HIA         | Frans Roodt                             | 30/11/2015 | Phase 1 Heritage Impact Assessment Report: the Duel 186 Mt Remaining Extent, Vhembe District Municipality, Limpopo |



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**APPENDICES**



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## APPENDIX 1: Heritage Screener



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## HERITAGE SCREENER

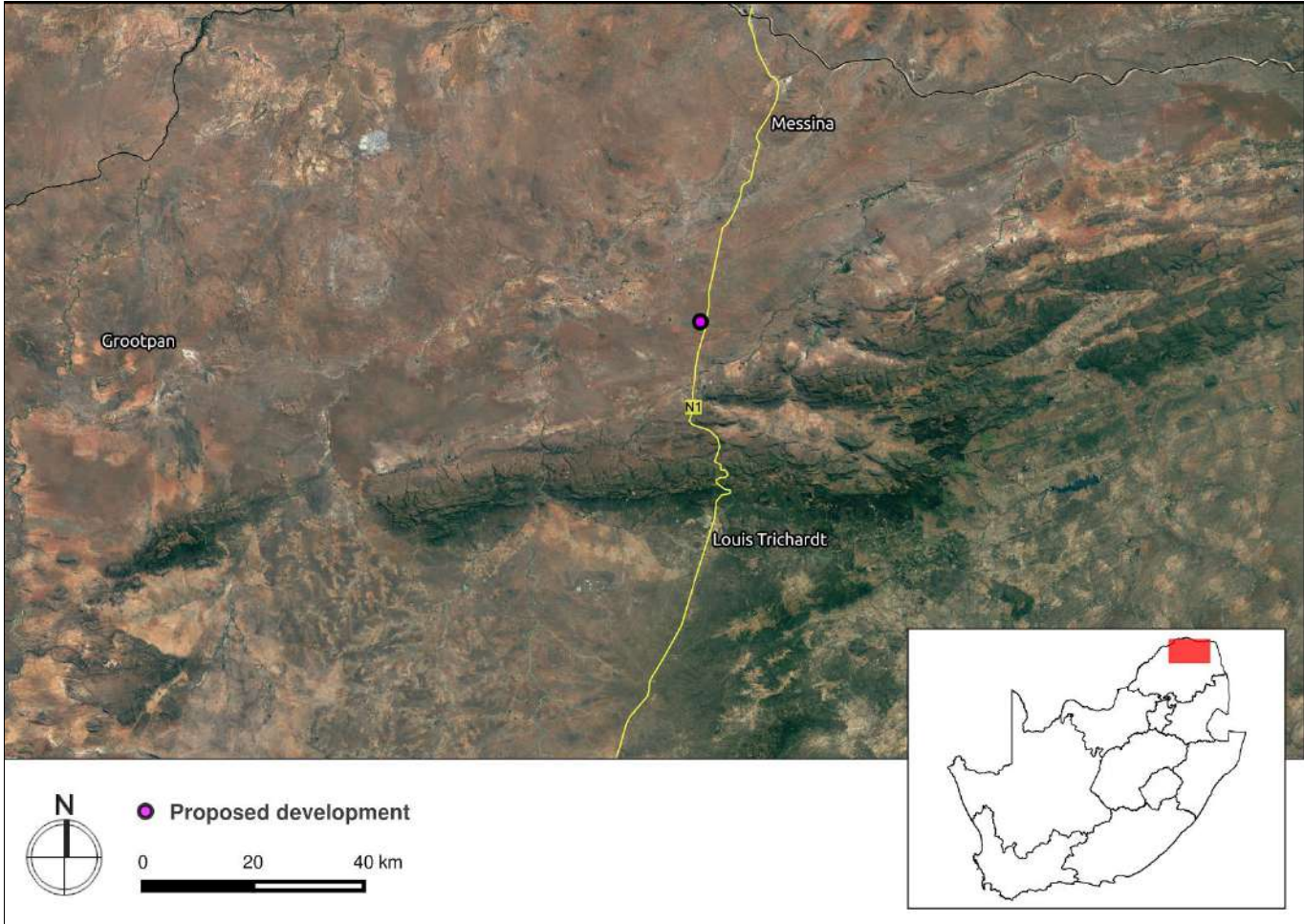
|   |  |
|---|--|
| CTS Reference Number:   | <b>CTS16_062</b>   |
| SAHRA Ref:  |  |
| Client:   | <b>Savannah Environmental</b>  |
| Date:   | <b>11/01/2016</b>  |
| Title:  | <b>Makhado Screening Study</b>   |
|  |  |
| Recommendation by CTS Heritage Specialists: (Type 2)                                | <b>RECOMMENDATION: The heritage resources and the area proposed for development are only partially recorded</b><br>See Section 8 for full recommendations. |

Figure 1a. Satellite map indicating the location of the proposed development in the Limpopo Province

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## 1. Proposed Development Summary

Savannah Environmental is undertaking a careening study for a new power station in the Messina/Makhado area in the Limpopo Province.

## 2. Application References

|   |   |
|---|---|
| <b>Name of relevant heritage authority(s)</b> | Limpopo Heritage Resources Authority (LIHRA)                        |
| <b>Name of decision making authority(s)</b>   | Limpopo Department of Economic Development, Environment and Tourism |

## 3. Property Information

|                                      |   |
|--------------------------------------|---|
| <b>Latitude / Longitude</b>          | S -22.7256984024 ; E 29.8979233886 (centroid) |
| <b>Erf number / Farm number</b>      | Numerous                                      |
| <b>Local Municipality</b>            | Musina & Makhado                              |
| <b>District Municipality</b>         | Vhembe  |
| <b>Previous Magisterial District</b> | Messina, Soutpansberg, Dzanani                |
| <b>Province</b>                      | Limpopo                                       |
| <b>Current Use</b>                   | Various                                       |
| <b>Current Zoning</b>                | Various                                       |
| <b>Total Extent</b>                  | 138 543,581 ha                                |

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#### 4. Nature of the Proposed Development

|   |                |
|---|----------------|
| Total Surface Area                              | 138 543,581 ha |
| Depth of excavation (m)                         | NA             |
| Height of development (m)                       | NA             |
| Expected years of operation before decommission | NA             |

#### 5. Category of Development

|   |          |
|---|----------|
| Triggers: Section 38(8) of the National Heritage Resources Act  | <b>X</b> |
| Triggers: Section 38(1) of the National Heritage Resources Act  |          |
| 1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length. |          |
| 2. Construction of a bridge or similar structure exceeding 50m in length.   |          |
| 3. Any development or activity that will change the character of a site-  |          |
| a) exceeding 5 000m <sup>2</sup> in extent  | <b>X</b> |
| b) involving three or more existing erven or subdivisions thereof   | <b>X</b> |
| c) involving three or more erven or divisions thereof which have been consolidated within the past five years                           |          |
| 4. Rezoning of a site exceeding 10 000m <sup>2</sup>  |          |
| 5. Other (state):   |          |

#### 6. Additional Infrastructure Required for this Development

|                      |
|----------------------|
| Not available as yet |
|----------------------|

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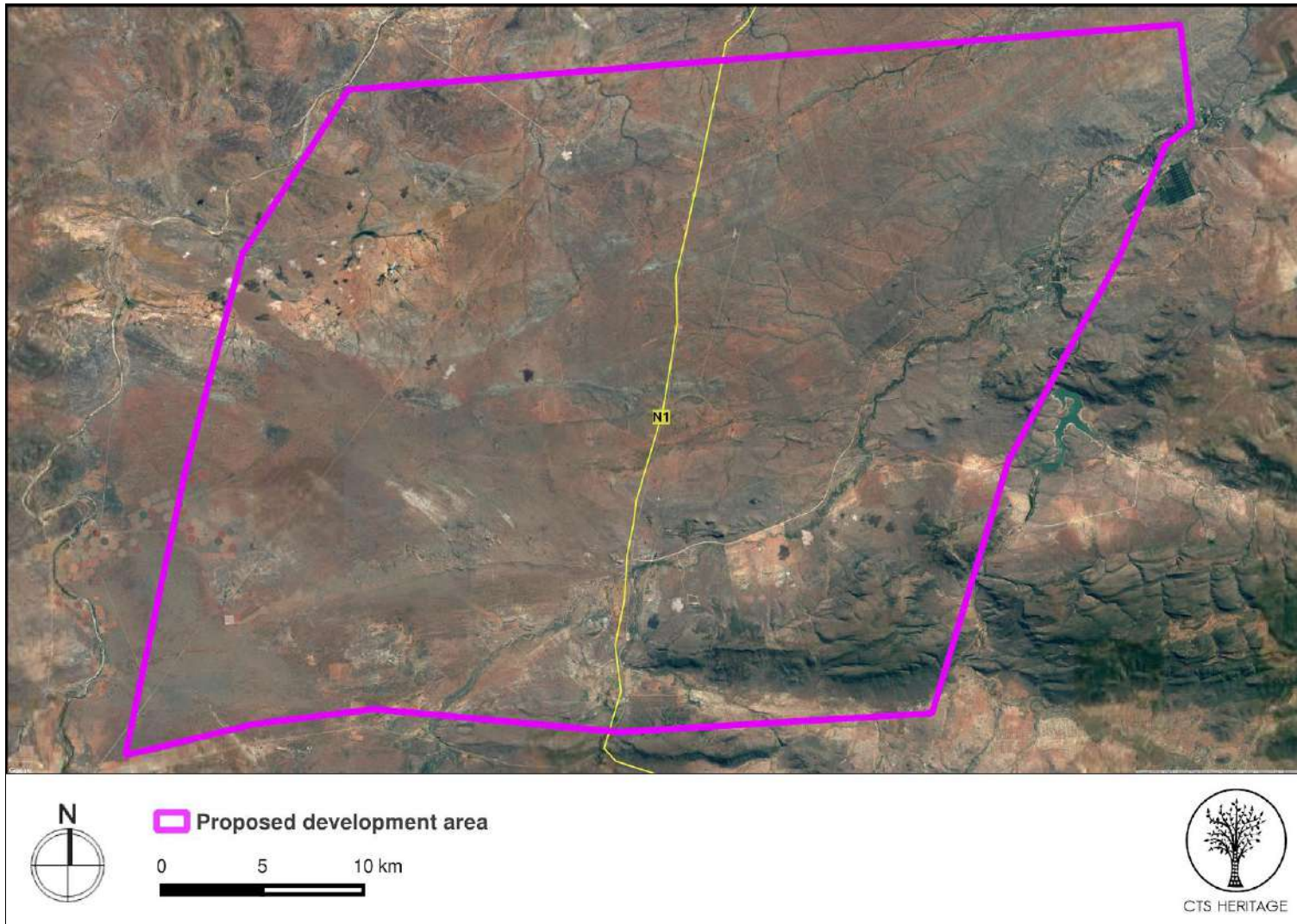
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## 7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)



**Figure 1b. Overview Map.** Satellite image (2016) indicating the proposed development area at closer range.

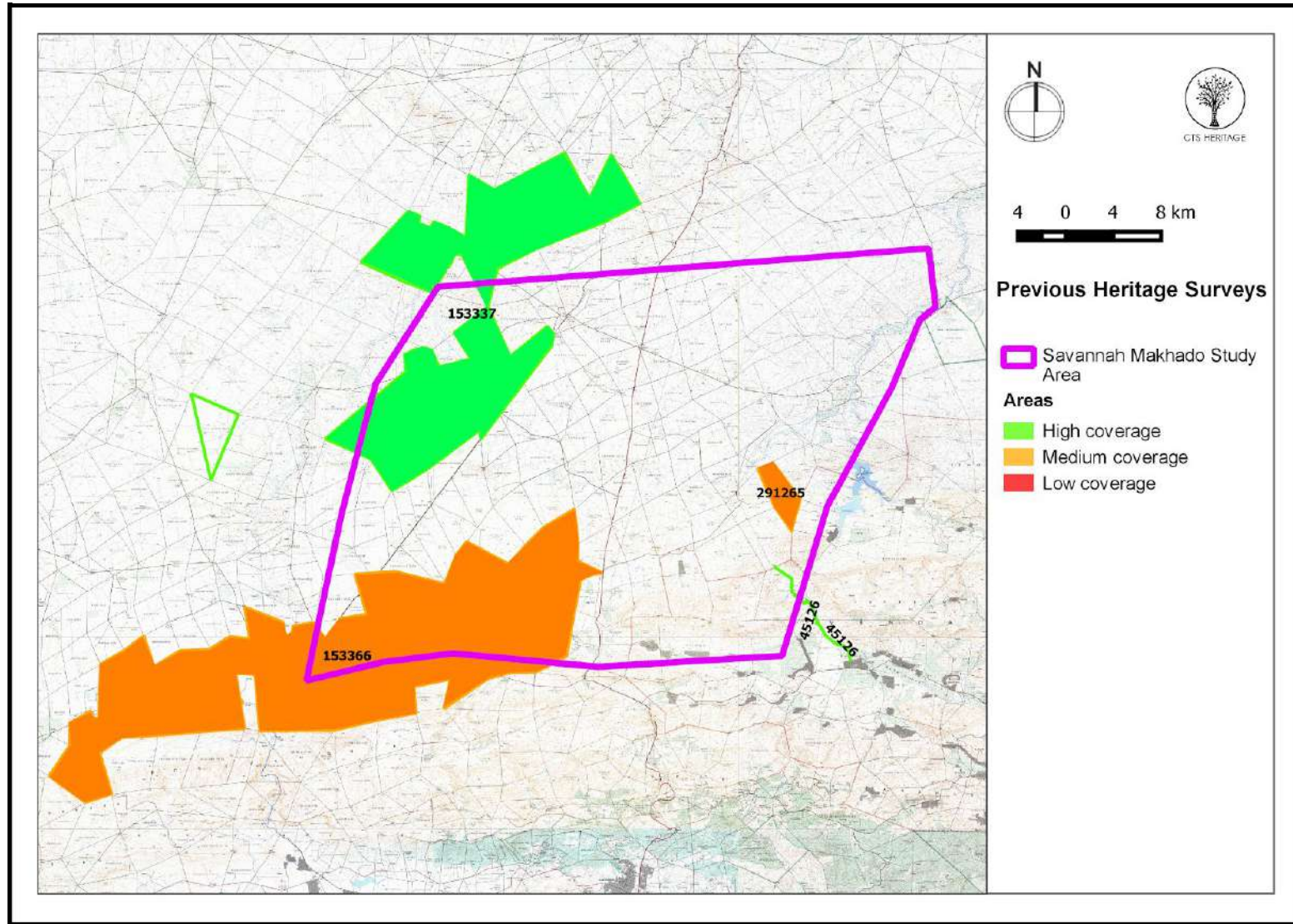
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**Figure 2. Previous HIAs map.** Previous Heritage Impact Assessments (excluding PIAs) surrounding the proposed development area within 17km, with SAHRIS NIDS indicated (please see Appendix 2 for full reference list).

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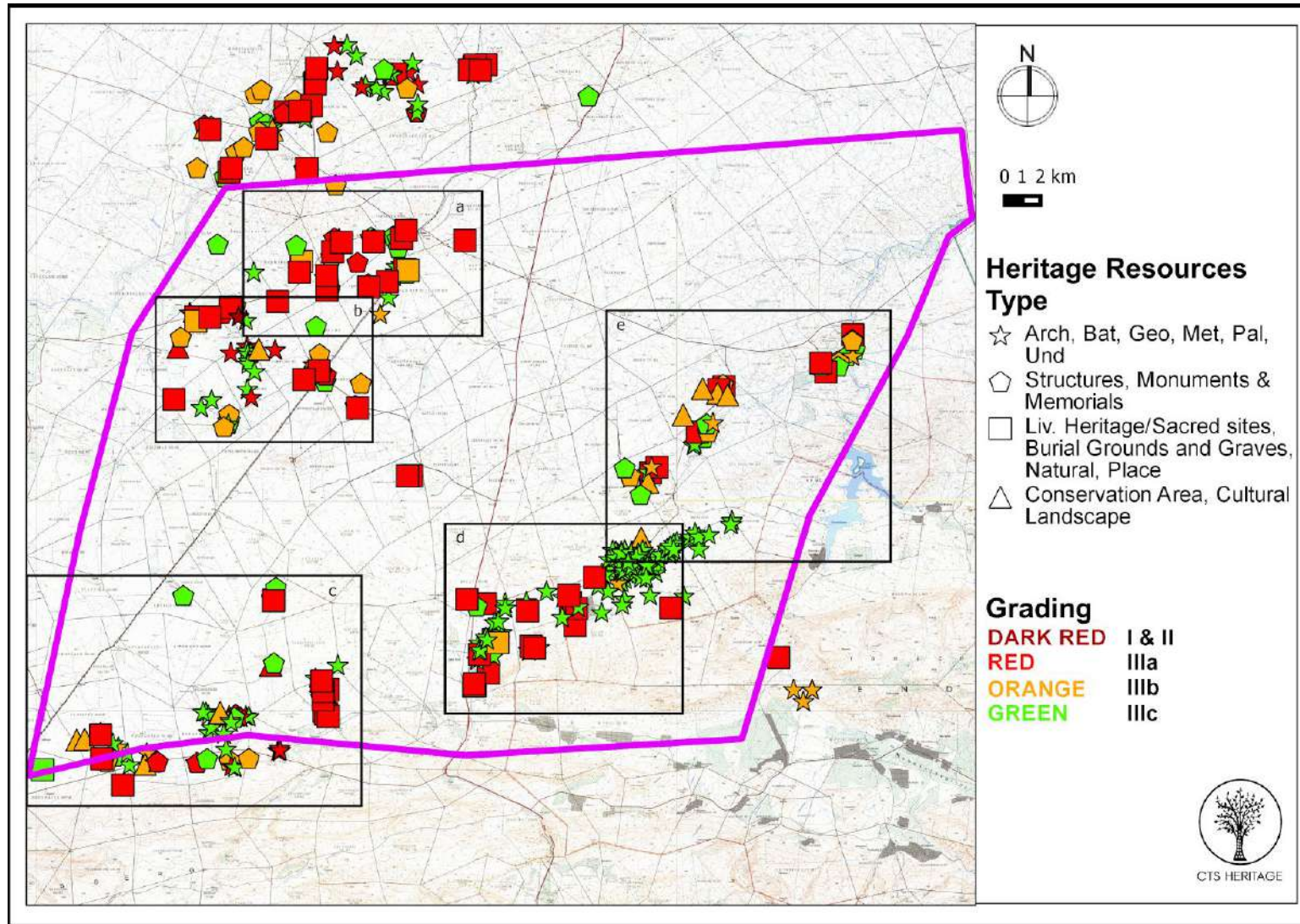
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**Figure 3. Heritage Resources Map.** Heritage resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Figures 4b-4F for insets). See Appendix 4 for full description of heritage resource types.

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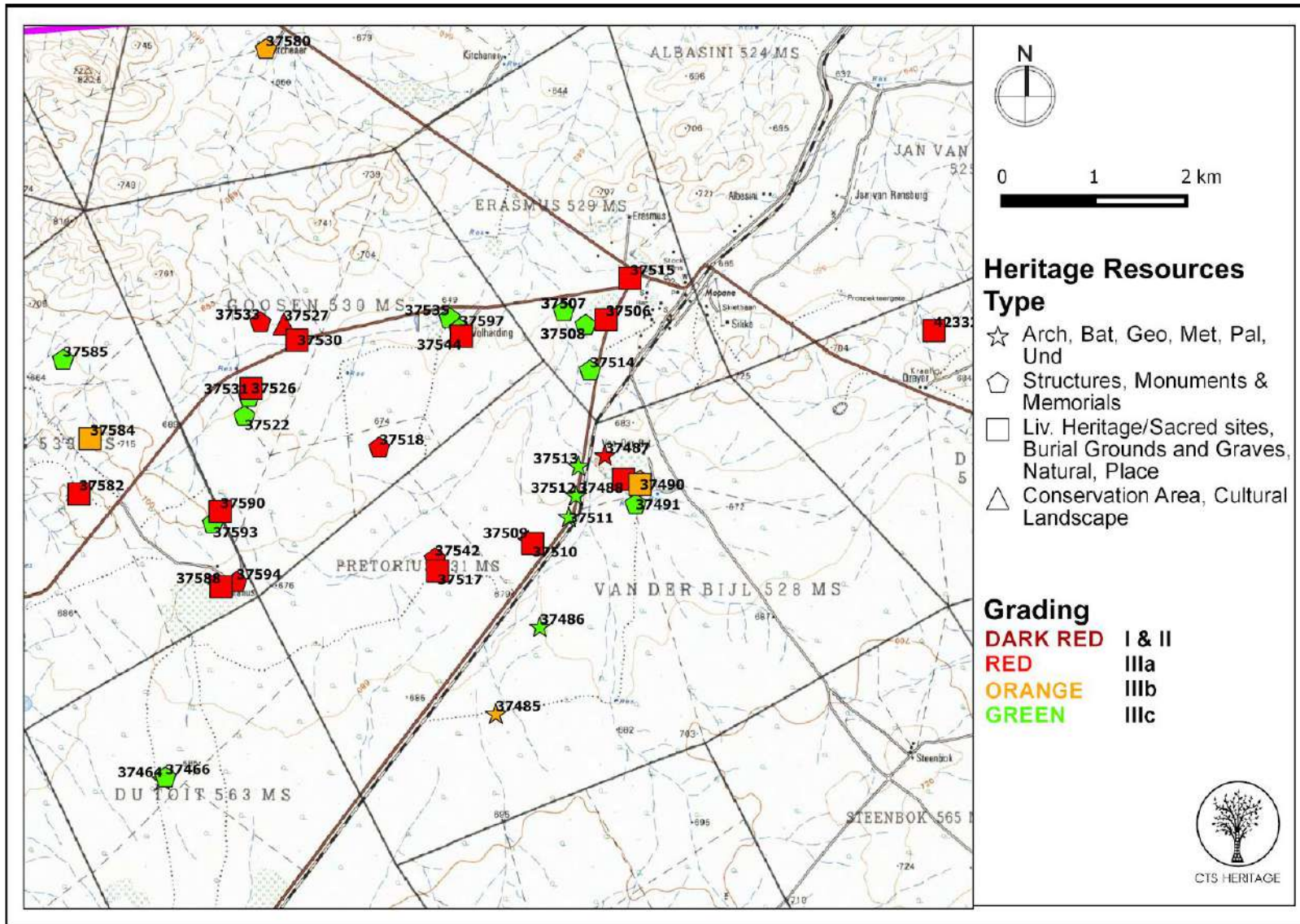


Figure 3a. Inset map.

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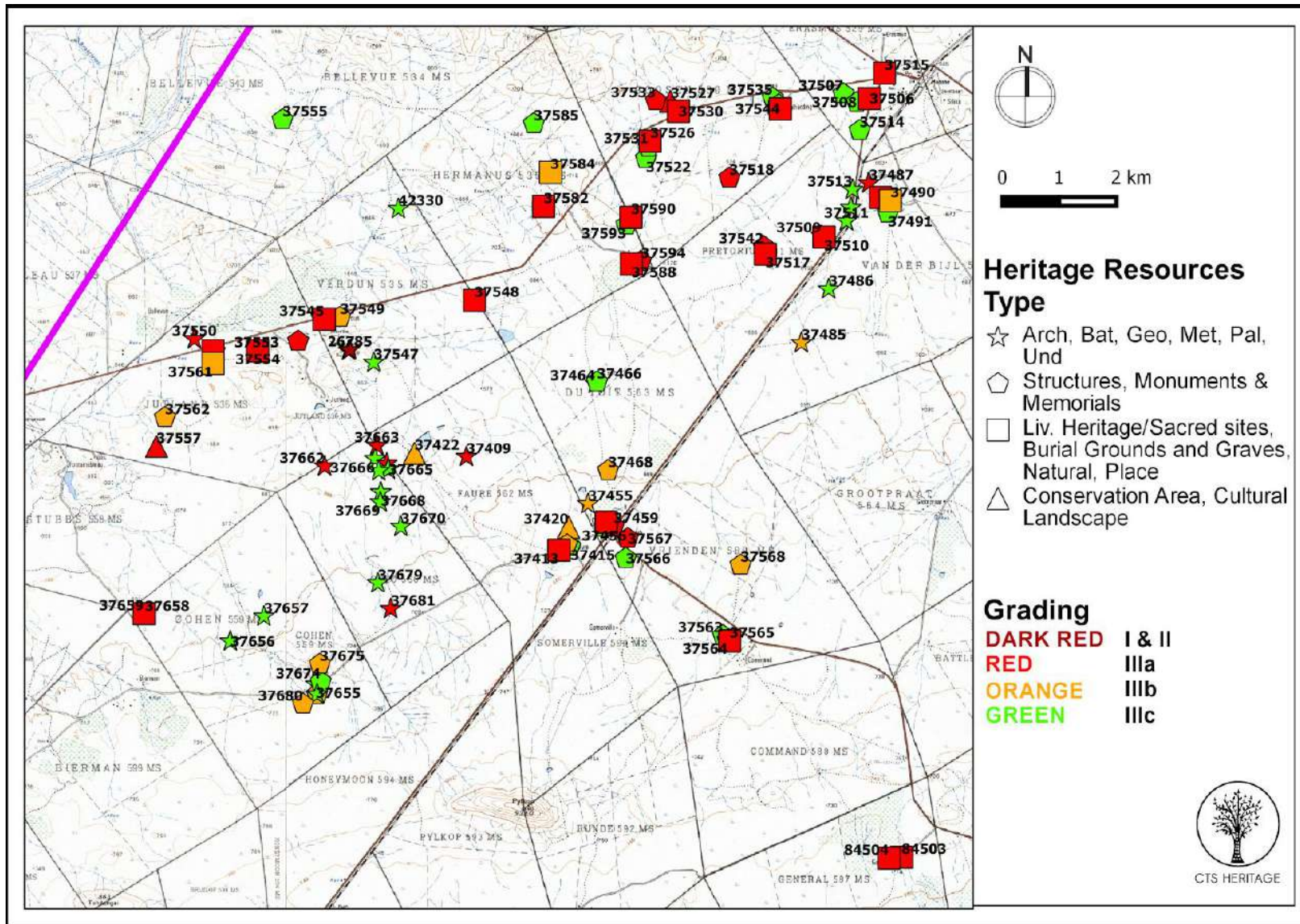


Figure 3b. Inset map.



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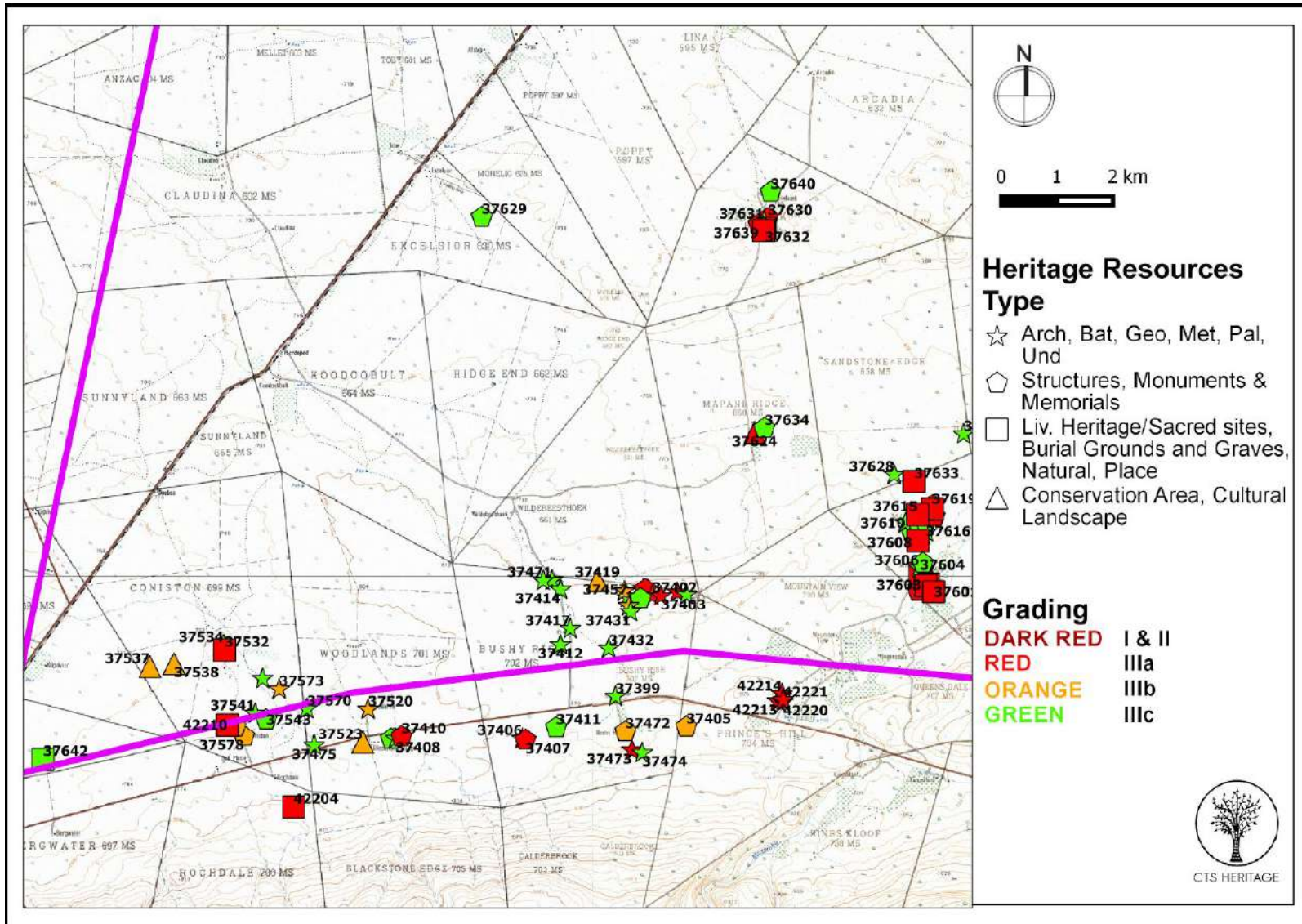


Figure 3c. Inset map.





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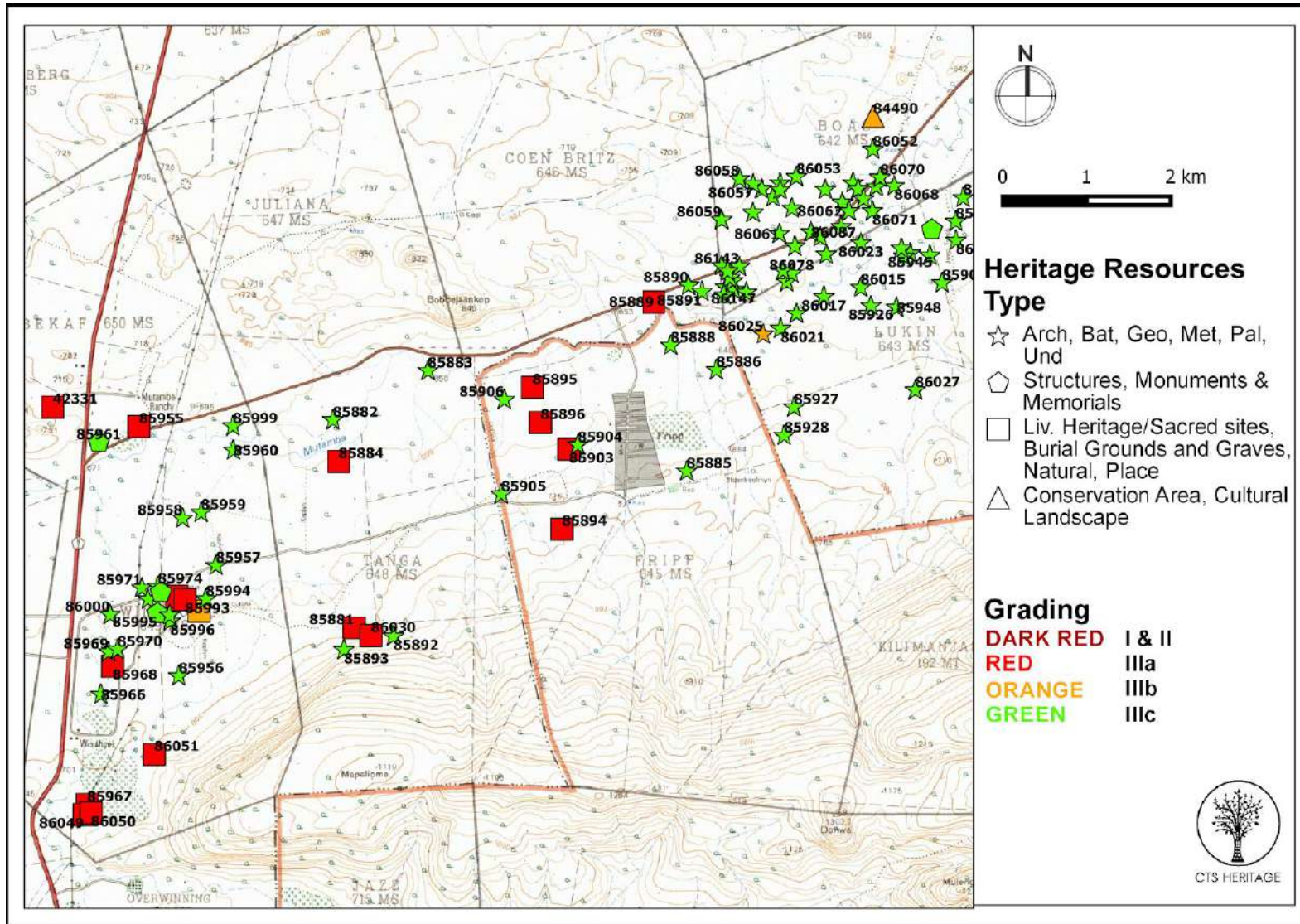


Figure 3d. Inset map.





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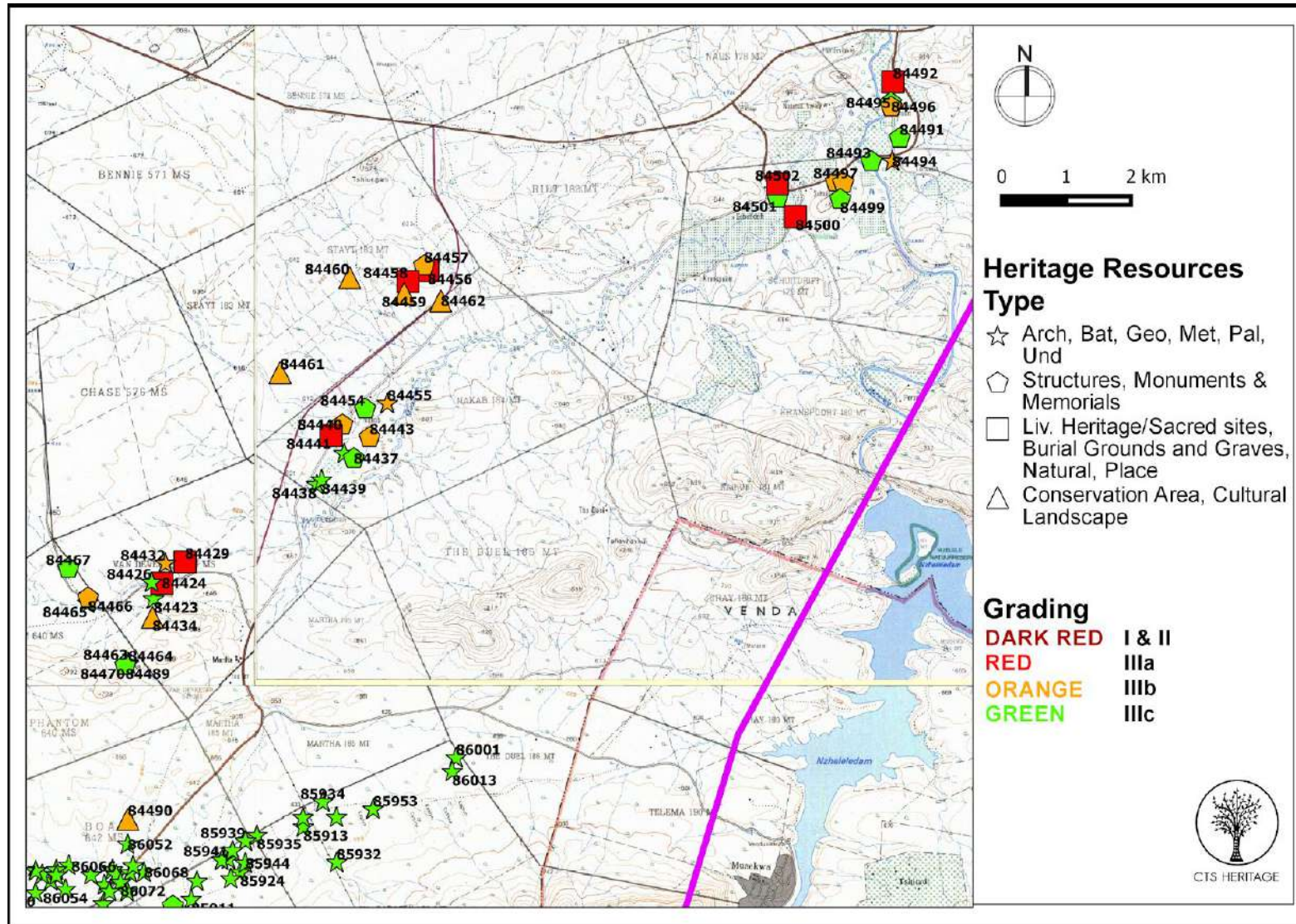
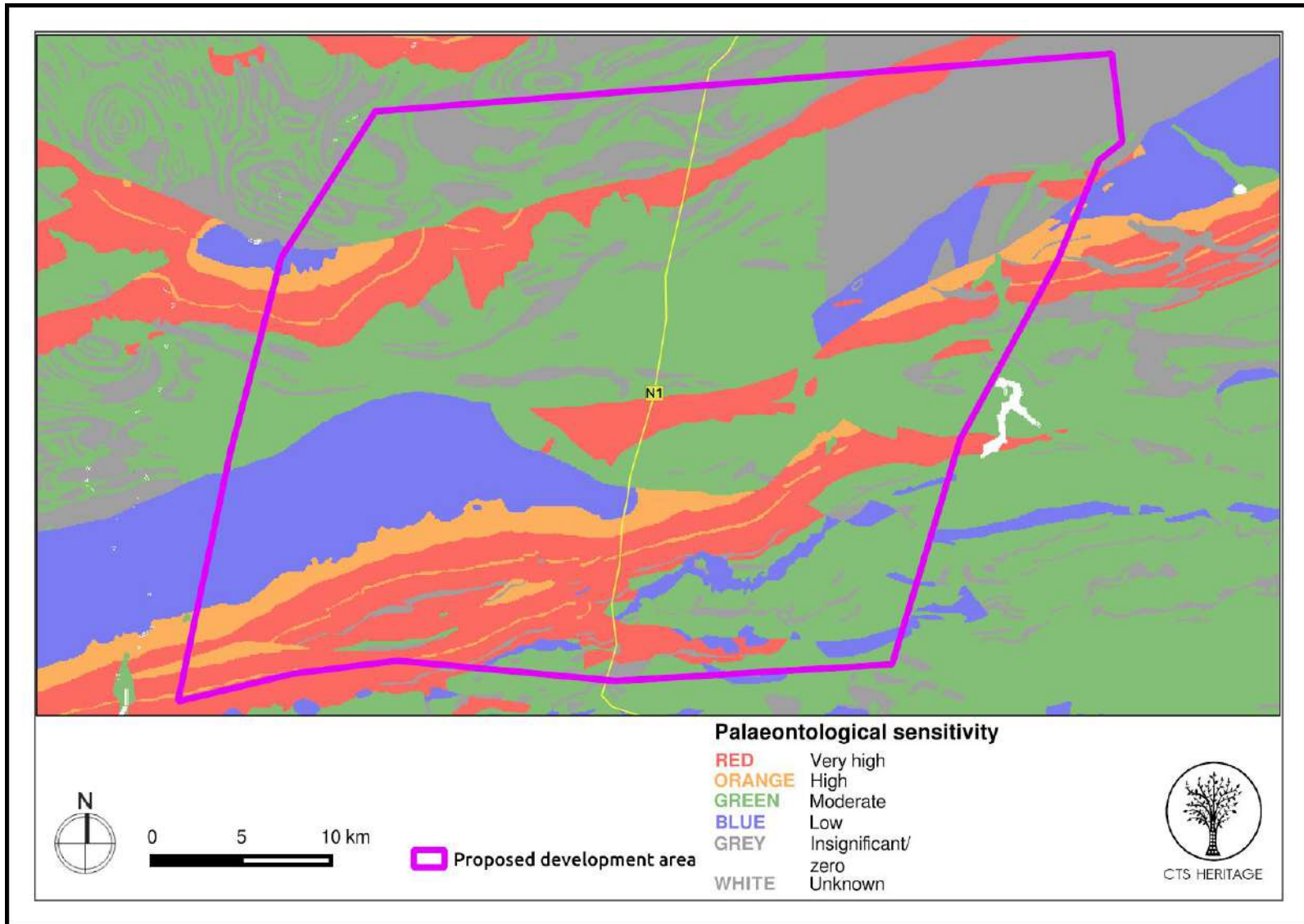


Figure 3e. Inset map.



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**Figure 4. Palaeosensitivity Map**, indicating varied fossil sensitivity underlying the study area. See Appendix 3 for full guide to the legend.

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## 8. Heritage statement and character of the area

The large screening study area consists of cultivated land, towns as well as infrastructure such as National roads and a nature reserve. CTS Heritage was requested to provide an overview of the known heritage resources within this area as well as the areas of likely heritage sensitivity to inform the selection of project locality alternatives.

The screening study area for this proposed new power station is rich in heritage resources including areas that have high to very high sensitivity for palaeontological resources. Any proposed development that impacts on these sensitive areas will require a full palaeontological assessment as well as a protocol for chance finds.

In terms of archaeological resources, significant Stone Age and Iron Age resources are known from this area (see maps 3a to 3e above as well as Appendix 1). In the above maps, the areas which appear to be void of archaeological resources **have not yet been systematically surveyed** and as such, will require detailed field analysis as part of any additional heritage studies that will be completed for this project.

This area is also known for its numerous informal burial grounds and graves. These are spaces that are sacred to the communities that live here and should be accorded the appropriate respect.

It is important to note that any location selected within this larger screening area will likely require further heritage assessment in terms of likely impact to archaeological resources and informal burial grounds due to the sensitivity of the region.

### **RECOMMENDATION:**

**The heritage resources and the area proposed for development are only partially recorded**

**Depending on the location alternatives selected for the proposed development, it is likely that a full Heritage Impact Assessment in terms of Section 38(3) of the NHRA will be required for this proposed development.**



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## APPENDIX 1

### List of heritage resources within the screening area

| Site ID | Site no  | Full Site Name       | Site Type               | Grading    |
|---------|----------|----------------------|-------------------------|------------|
| 85974   | MAKHA064 | Makhado Colliery 064 | Artefacts               | Grade IIIc |
| 85975   | MAKHA065 | Makhado Colliery 065 | Burial Grounds & Graves | Grade IIIa |
| 86140   | MAKHA117 | Makhado Colliery 117 | Artefacts               | Grade IIIc |
| 86142   | MAKHA118 | Makhado Colliery 118 | Artefacts               | Grade IIIc |
| 86143   | MAKHA119 | Makhado Colliery 119 | Artefacts               | Grade IIIc |
| 86144   | MAKHA120 | Makhado Colliery 120 | Artefacts               | Grade IIIc |
| 86145   | MAKHA121 | Makhado Colliery 121 | Artefacts               | Grade IIIc |
| 86147   | MAKHA123 | Makhado Colliery 123 | Artefacts               | Grade IIIc |
| 86148   | MAKHA124 | Makhado Colliery 124 | Artefacts               | Grade IIIc |
| 86149   | MAKHA125 | Makhado Colliery 125 | Artefacts               | Grade IIIc |
| 85992   | MAKHA066 | Makhado Colliery 066 | Burial Grounds & Graves | Grade IIIa |
| 86151   | MAKHA127 | Makhado Colliery 127 | Artefacts               | Grade IIIc |
| 85994   | MAKHA068 | Makhado Colliery 068 | Settlement              | Grade IIIc |
| 85996   | MAKHA070 | Makhado Colliery 070 | Archaeological          | Grade IIIc |
| 85998   | MAKHA072 | Makhado Colliery 072 | Structures              | Grade IIIc |
| 86146   | MAKHA122 | Makhado Colliery 122 | Artefacts               | Grade IIIc |
| 85999   | MAKHA073 | Makhado Colliery 073 | Archaeological          | Grade IIIc |

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|-------|----------|---------------------------|------------------------------------|------------|
| 86000 | MAKHA074 | Makhado Colliery 074      | Deposit                            | Grade IIIc |
| 86150 | MAKHA126 | Makhado Colliery 126      | Artefacts                          | Grade IIIc |
| 86001 | MAKHA075 | Makhado Colliery 075      | Artefacts                          | Grade IIIc |
| 85993 | MAKHA067 | Makhado Colliery 067      | Burial Grounds & Graves            | Grade IIIa |
| 85995 | MAKHA069 | Makhado Colliery 069      | Structures                         | Grade IIIc |
| 85997 | MAKHA071 | Makhado Colliery 071      | Artefacts                          | Grade IIIc |
| 86013 | MAKHA076 | Makhado Colliery 076      | Artefacts                          | Grade IIIc |
| 86015 | MAKHA077 | Makhado Colliery 077      | Artefacts                          | Grade IIIc |
| 86017 | MAKHA078 | Makhado Colliery 078      | Artefacts                          | Grade IIIc |
| 84423 | GENE003  | Generaal Project area 003 | Artefacts                          | Grade IIIc |
| 86019 | MAKHA079 | Makhado Colliery 079      | Artefacts                          | Grade IIIc |
| 84424 | GENE004  | Generaal Project area 004 | Burial Grounds & Graves            | Grade IIIa |
| 86021 | MAKHA080 | Makhado Colliery 080      | Deposit                            | Grade IIIc |
| 84426 | GENE005  | Generaal Project area 005 | Archaeological                     | Grade IIIc |
| 86023 | MAKHA083 | Makhado Colliery 083      | Artefacts                          | Grade IIIc |
| 84429 | GENE006  | Generaal Project area 006 | Burial Grounds & Graves            | Grade IIIa |
| 86025 | MAKHA081 | Makhado Colliery 081      | Artefacts                          | Grade IIIb |
| 85882 | MAKHA002 | Makhado Colliery 002      | Artefacts                          | Grade IIIc |
| 84434 | GENE008  | Generaal Project area 008 | Cultural Landscape                 | Grade IIIb |
| 85883 | MAKHA003 | Makhado Colliery 003      | Artefacts                          | Grade IIIc |
| 85884 | MAKHA004 | Makhado Colliery 004      | Artefacts, Burial Grounds & Graves | Grade IIIa |



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|       |          |                           |                         |            |
|-------|----------|---------------------------|-------------------------|------------|
| 86029 | MAKHA085 | Makhado Colliery 085      | Artefacts               | Grade IIIc |
| 84436 | GENE009  | Generaal Project area 009 | Settlement              | Grade IIIc |
| 85885 | MAKHA005 | Makhado Colliery 005      | Artefacts               | Grade IIIc |
| 84437 | GENE010  | Generaal Project area 010 | Structures              | Grade IIIc |
| 85886 | MAKHA006 | Makhado Colliery 006      | Artefacts               | Grade IIIc |
| 86027 | MAKHA082 | Makhado Colliery 082      | Artefacts               | Grade IIIc |
| 84438 | GENE011  | Generaal Project area 011 | Archaeological          | Grade IIIc |
| 86028 | MAKHA084 | Makhado Colliery 084      | Artefacts               | Grade IIIc |
| 84439 | GENE012  | Generaal Project area 012 | Archaeological          | Grade IIIc |
| 85888 | MAKHA007 | Makhado Colliery 007      | Artefacts               | Grade IIIc |
| 84440 | GENE013  | Generaal Project area 013 | Building                | Grade IIIb |
| 84441 | GENE014  | Generaal Project area 014 | Burial Grounds & Graves | Grade IIIa |
| 85890 | MAKHA009 | Makhado Colliery 009      | Artefacts               | Grade IIIc |
| 84442 | GENE015  | Generaal Project area 015 | Building                | Grade IIIb |
| 85891 | MAKHA010 | Makhado Colliery 010      | Artefacts               | Grade IIIc |
| 84443 | GENE016  | Generaal Project area 016 | Building                | Grade IIIb |
| 84432 | GENE007  | Generaal Project area 007 | Archaeological          | Grade IIIb |
| 85893 | MAKHA012 | Makhado Colliery 012      | Rock Art                | Grade IIIc |
| 85894 | MAKHA013 | Makhado Colliery 013      | Burial Grounds & Graves | Grade IIIa |
| 85896 | MAKHA015 | Makhado Colliery 015      | Burial Grounds & Graves | Grade IIIa |
| 85892 | MAKHA011 | Makhado Colliery 011      | Artefacts               | Grade IIIc |

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|-------|----------|---------------------------|-------------------------|------------|
| 37457 | CHA021   | Chapaudi 021              | Artefacts               | Grade IIIc |
| 84454 | GENE017  | Generaal Project area 017 | Artefacts, Structures   | Grade IIIc |
| 84455 | GENE018  | Generaal Project area 018 | Artefacts               | Grade IIIb |
| 84456 | GENE019  | Generaal Project area 019 | Burial Grounds & Graves | Grade IIIa |
| 84457 | GENE020  | Generaal Project area 020 | Structures              | Grade IIIb |
| 84458 | GENE021  | Generaal Project area 021 | Burial Grounds & Graves | Grade IIIa |
| 85903 | MAKHA016 | Makhado Colliery 016      | Burial Grounds & Graves | Grade IIIa |
| 37464 | MOP035   | Mopane 035                | Deposit                 | Grade IIIc |
| 84459 | GENE022  | Generaal Project area 022 | Cultural Landscape      | Grade IIIb |
| 85904 | MAKHA017 | Makhado Colliery 017      | Artefacts               | Grade IIIc |
| 84460 | GENE023  | Generaal Project area 023 | Cultural Landscape      | Grade IIIb |
| 85905 | MAKHA018 | Makhado Colliery 018      | Artefacts               | Grade IIIc |
| 86049 | MAKHA087 | Makhado Colliery 087      | Burial Grounds & Graves | Grade IIIa |
| 84461 | GENE024  | Generaal Project area 024 | Cultural Landscape      | Grade IIIb |
| 85906 | MAKHA019 | Makhado Colliery 019      | Artefacts               | Grade IIIc |
| 86050 | MAKHA088 | Makhado Colliery 088      | Burial Grounds & Graves | Grade IIIa |
| 84462 | GENE025  | Generaal Project area 025 | Cultural Landscape      | Grade IIIb |
| 84463 | GENE026  | Generaal Project area 026 | Settlement              | Grade IIIa |
| 85907 | MAKHA020 | Makhado Colliery 020      | Artefacts               | Grade IIIc |
| 86051 | MAKHA089 | Makhado Colliery 089      | Place                   | Grade IIIa |
| 84464 | GENE027  | Generaal Project area 027 | Archaeological          | Grade IIIa |

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|-------|----------|---------------------------|---|------------|
| 86052 | MAKHA090 | Makhado Colliery 090      | Artefacts                               | Grade IIIc |
| 84465 | GENE028  | Generaal Project area 028 | Archaeological                          | Grade IIIc |
| 84466 | GENE029  | Generaal Project area 029 | Building                                | Grade IIIb |
| 85909 | MAKHA021 | Makhado Colliery 021      | Artefacts                               | Grade IIIc |
| 86053 | MAKHA091 | Makhado Colliery 091      | Artefacts                               | Grade IIIc |
| 84467 | GENE030  | Generaal Project area 030 | Structures                              | Grade IIIc |
| 85910 | MAKHA022 | Makhado Colliery 022      | Structures                              | Grade IIIc |
| 86054 | MAKHA092 | Makhado Colliery 092      | Artefacts                               | Grade IIIc |
| 85911 | MAKHA023 | Makhado Colliery 023      | Artefacts                               | Grade IIIc |
| 86055 | MAKHA093 | Makhado Colliery 093      | Artefacts                               | Grade IIIc |
| 37471 | CHA026   | Chapaudi 026              | Artefacts                               | Grade IIIc |
| 84472 | GENE032  | Generaal Project area 032 | Structures                              | Grade IIIc |
| 85912 | MAKHA024 | Makhado Colliery 024      | Artefacts                               | Grade IIIc |
| 86056 | MAKHA094 | Makhado Colliery 094      | Artefacts                               | Grade IIIc |
| 85913 | MAKHA025 | Makhado Colliery 025      | Artefacts                               | Grade IIIc |
| 86057 | MAKHA095 | Makhado Colliery 095      | Artefacts                               | Grade IIIc |
| 84470 | GENE031  | Generaal Project area 031 | Stone walling                           | Grade IIIa |
| 86058 | MAKHA096 | Makhado Colliery 096      | Artefacts                               | Grade IIIc |
| 85881 | MAKHA001 | Makhado Colliery 001      | Archaeological, Burial Grounds & Graves | Grade IIIa |
| 85889 | MAKHA008 | Makhado Colliery 008      | Artefacts, Burial Grounds & Graves      | Grade IIIa |
| 85895 | MAKHA014 | Makhado Colliery 014      | Artefacts, Burial Grounds & Graves      | Grade IIIa |



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|-------|----------|---------------------------|-------------------------|------------|
| 86059 | MAKHA097 | Makhado Colliery 097      | Artefacts               | Grade IIIc |
| 86060 | MAKHA098 | Makhado Colliery 098      | Artefacts               | Grade IIIc |
| 86061 | MAKHA099 | Makhado Colliery 099      | Artefacts               | Grade IIIc |
| 86062 | MAKHA100 | Makhado Colliery 100      | Artefacts               | Grade IIIc |
| 85924 | MAKHA026 | Makhado Colliery 026      | Artefacts               | Grade IIIc |
| 86063 | MAKHA101 | Makhado Colliery 101      | Artefacts               | Grade IIIc |
| 84489 | GENE033  | Generaal Project area 033 | Building                | Grade IIIc |
| 85925 | MAKHA027 | Makhado Colliery 027      | Artefacts               | Grade IIIc |
| 86064 | MAKHA102 | Makhado Colliery 102      | Artefacts               | Grade IIIc |
| 86065 | MAKHA103 | Makhado Colliery 103      | Artefacts               | Grade IIIc |
| 84490 | GENE034  | Generaal Project area 034 | Cultural Landscape      | Grade IIIb |
| 85926 | MAKHA028 | Makhado Colliery 028      | Artefacts               | Grade IIIc |
| 84491 | GENE035  | Generaal Project area 035 | Structures              | Grade IIIc |
| 85927 | MAKHA029 | Makhado Colliery 029      | Artefacts               | Grade IIIc |
| 86066 | MAKHA104 | Makhado Colliery 104      | Artefacts               | Grade IIIc |
| 84492 | GENE036  | Generaal Project area 036 | Burial Grounds & Graves | Grade IIIa |
| 85928 | MAKHA030 | Makhado Colliery 030      | Artefacts               | Grade IIIc |
| 86067 | MAKHA105 | Makhado Colliery 105      | Artefacts               | Grade IIIc |
| 84493 | GENE037  | Generaal Project area 037 | Structures              | Grade IIIc |
| 86068 | MAKHA106 | Makhado Colliery 106      | Artefacts               | Grade IIIc |
| 84494 | GENE038  | Generaal Project area 038 | Archaeological          | Grade IIIb |



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|-------|----------|---------------------------|-------------------------|------------|
| 85930 | MAKHA031 | Makhado Colliery 031      | Artefacts               | Grade IIIc |
| 86069 | MAKHA107 | Makhado Colliery 107      | Artefacts               | Grade IIIc |
| 84495 | GENE039  | Generaal Project area 039 | Building                | Grade IIIc |
| 86070 | MAKHA108 | Makhado Colliery 108      | Artefacts               | Grade IIIc |
| 84496 | GENE040  | Generaal Project area 040 | Building                | Grade IIIb |
| 85932 | MAKHA032 | Makhado Colliery 032      | Artefacts               | Grade IIIc |
| 86071 | MAKHA109 | Makhado Colliery 109      | Artefacts               | Grade IIIc |
| 84497 | GENE041  | Generaal Project area 041 | Building                | Grade IIIb |
| 85933 | MAKHA033 | Makhado Colliery 033      | Artefacts               | Grade IIIc |
| 86072 | MAKHA110 | Makhado Colliery 110      | Artefacts               | Grade IIIc |
| 84498 | GENE042  | Generaal Project area 042 | Building                | Grade IIIb |
| 85934 | MAKHA034 | Makhado Colliery 034      | Artefacts               | Grade IIIc |
| 86073 | MAKHA111 | Makhado Colliery 111      | Artefacts               | Grade IIIc |
| 84499 | GENE043  | Generaal Project area 043 | Building                | Grade IIIc |
| 85935 | MAKHA035 | Makhado Colliery 035      | Artefacts               | Grade IIIc |
| 84500 | GENE044  | Generaal Project area 044 | Burial Grounds & Graves | Grade IIIa |
| 84501 | GENE045  | Generaal Project area 045 | Structures              | Grade IIIc |
| 86076 | MAKHA112 | Makhado Colliery 112      | Artefacts               | Grade IIIc |
| 84502 | GENE046  | Generaal Project area 046 | Burial Grounds & Graves | Grade IIIa |
| 84503 | GENE047  | Generaal Project area 047 | Burial Grounds & Graves | Grade IIIa |
| 86078 | MAKHA113 | Makhado Colliery 113      | Artefacts               | Grade IIIc |

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|-------|----------|---------------------------|--------------------------|------------|
| 84504 | GENE048  | Generaal Project area 048 | Burial Grounds & Graves  | Grade IIIa |
| 85939 | MAKHA036 | Makhado Colliery 036      | Deposit                  | Grade IIIc |
| 86081 | MAKHA114 | Makhado Colliery 114      | Artefacts                | Grade IIIc |
| 85941 | MAKHA038 | Makhado Colliery 038      | Artefacts                | Grade IIIc |
| 85942 | MAKHA039 | Makhado Colliery 039      | Artefacts                | Grade IIIc |
| 85943 | MAKHA040 | Makhado Colliery 040      | Archaeological           | Grade IIIc |
| 86084 | MAKHA115 | Makhado Colliery 115      | Artefacts                | Grade IIIc |
| 85944 | MAKHA041 | Makhado Colliery 041      | Stone walling            | Grade IIIc |
| 85945 | MAKHA042 | Makhado Colliery 042      | Artefacts                | Grade IIIc |
| 86087 | MAKHA116 | Makhado Colliery 116      | Artefacts                | Grade IIIc |
| 85946 | MAKHA043 | Makhado Colliery 043      | Artefacts                | Grade IIIc |
| 85947 | MAKHA044 | Makhado Colliery 044      | Artefacts                | Grade IIIc |
| 85948 | MAKHA045 | Makhado Colliery 045      | Artefacts                | Grade IIIc |
| 37487 | MOP050   | Mopane 050                | Artefacts                | Grade IIIa |
| 85952 | MAKHA046 | Makhado Colliery 046      | Stone walling            | Grade IIIc |
| 85953 | MAKHA047 | Makhado Colliery 047      | Artefacts                | Grade IIIc |
| 37489 | MOP052   | Mopane 052                | Structures               | Grade IIIb |
| 37491 | MOP054   | Mopane 054                | Building                 | Grade IIIc |
| 37469 | CHA022   | Chapaudi 022              | Stone walling            | Grade IIIb |
| 37461 | CHA023   | Chapaudi 023              | Stone walling, Artefacts | Grade IIIa |
| 37465 | CHA024   | Chapaudi 024              | Stone walling, Artefacts | Grade IIIa |

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|-------|--------|--------------|---------------------------|------------|
| 37467 | CHA025 | Chapaudi 025 | Stone walling             | Grade IIIc |
| 37507 | MOP070 | Mopane 070   | Artefacts, Building       | Grade IIIc |
| 37508 | MOP071 | Mopane 071   | Structures                | Grade IIIc |
| 37509 | MOP072 | Mopane 072   | Artefacts                 | Grade IIIa |
| 37511 | MOP074 | Mopane 074   | Archaeological, Artefacts | Grade IIIc |
| 37512 | MOP075 | Mopane 075   | Archaeological, Artefacts | Grade IIIc |
| 37513 | MOP076 | Mopane 076   | Artefacts                 | Grade IIIc |
| 37514 | MOP077 | Mopane 077   | Structures                | Grade IIIc |
| 37518 | MOP081 | Mopane 081   | Structures                | Grade IIIa |
| 37522 | MOP082 | Mopane 082   | Building, Artefacts       | Grade IIIc |
| 37525 | MOP083 | Mopane 083   | Structures                | Grade IIIc |
| 37527 | MOP085 | Mopane 085   | Cultural Landscape        | Grade IIIa |
| 37531 | MOP087 | Mopane 087   | Structures                | Grade IIIc |
| 37533 | MOP088 | Mopane 088   | Structures                | Grade IIIa |
| 37534 | CHA036 | Chapaudi 036 | Artefacts                 | Grade IIIc |
| 37535 | MOP089 | Mopane 089   | Structures                | Grade IIIc |
| 37537 | CHA037 | Chapaudi 037 | Cultural Landscape        | Grade IIIb |
| 37538 | CHA038 | Chapaudi 038 | Cultural Landscape        | Grade IIIb |
| 37540 | MOP091 | Mopane 091   | Structures                | Grade IIIb |
| 37542 | MOP092 | Mopane 092   | Building                  | Grade IIIa |
| 37546 | MOP095 | Mopane 095   | Stone walling             | Grade IIIa |

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|-------|--------|--------------|------------------------------------|------------|
| 37547 | MOP096 | Mopane 096   | Artefacts                          | Grade IIIc |
| 37548 | MOP097 | Mopane 097   | Burial Grounds & Graves, Artefacts | Grade IIIa |
| 37549 | MOP098 | Mopane 098   | Building                           | Grade IIIb |
| 37550 | MOP099 | Mopane 099   | Artefacts, Archaeological          | Grade IIIa |
| 37551 | MOP100 | Mopane 100   | Structures, Deposit                | Grade IIIa |
| 37552 | MOP101 | Mopane 101   | Burial Grounds & Graves, Artefacts | Grade IIIa |
| 37553 | MOP102 | Mopane 102   | Artefacts                          | Grade IIIa |
| 37555 | MOP104 | Mopane 104   | Structures                         | Grade IIIc |
| 37556 | MOP105 | Mopane 105   | Artefacts, Structures              | Grade IIIa |
| 37557 | MOP106 | Mopane 106   | Cultural Landscape                 | Grade IIIa |
| 37561 | MOP108 | Mopane 108   | Place                              | Grade IIIb |
| 37562 | MOP109 | Mopane 109   | Building                           | Grade IIIb |
| 37563 | MOP110 | Mopane 110   | Structures, Deposit                | Grade IIIc |
| 37564 | MOP111 | Mopane 111   | Structures                         | Grade IIIc |
| 37566 | MOP113 | Mopane 113   | Structures                         | Grade IIIc |
| 37567 | MOP114 | Mopane 114   | Structures                         | Grade IIIa |
| 37568 | MOP115 | Mopane 115   | Building                           | Grade IIIb |
| 37573 | CHA042 | Chapaudi 042 | Artefacts                          | Grade IIIb |
| 37576 | CHA043 | Chapaudi 043 | Artefacts                          | Grade IIIc |
| 37580 | MOP120 | Mopane 120   | Building                           | Grade IIIb |
| 37584 | MOP122 | Mopane 122   | Natural                            | Grade IIIb |



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|-------|--------|--------------|-------------------------------------|------------|
| 37585 | MOP123 | Mopane 123   | Structures                          | Grade IIIc |
| 37587 | CHA048 | Chapaudi 048 | Artefacts, Stone walling, Deposit   | Grade IIIc |
| 37591 | CHA049 | Chapaudi 049 | Building                            | Grade IIIc |
| 37592 | CHA050 | Chapaudi 050 | Monuments & Memorials               | Grade IIIa |
| 37593 | MOP126 | Mopane 126   | Structures                          | Grade IIIc |
| 37594 | MOP127 | Mopane 127   | Building                            | Grade IIIa |
| 37455 | MOP031 | Mopane 031   | Artefacts                           | Grade IIIb |
| 37456 | MOP032 | Mopane 032   | Structures                          | Grade IIIc |
| 37459 | MOP034 | Mopane 034   | Building                            | Grade IIIa |
| 37466 | MOP036 | Mopane 036   | Structures                          | Grade IIIc |
| 37468 | MOP037 | Mopane 037   | Building                            | Grade IIIb |
| 37485 | MOP048 | Mopane 048   | Archaeological                      | Grade IIIb |
| 37486 | MOP049 | Mopane 049   | Archaeological                      | Grade IIIc |
| 37597 | MOP090 | Mopane 090   | Structures                          | Grade IIIc |
| 37602 | CHA052 | Chapaudi 052 | Settlement                          | Grade IIIc |
| 37603 | CHA053 | Chapaudi 053 | Burial Grounds & Graves, Settlement | Grade IIIa |
| 37604 | CHA054 | Chapaudi 054 | Burial Grounds & Graves, Structures | Grade IIIa |
| 37605 | CHA055 | Chapaudi 055 | Settlement                          | Grade IIIc |
| 37606 | CHA056 | Chapaudi 056 | Settlement                          | Grade IIIc |
| 37608 | CHA058 | Chapaudi 058 | Structures                          | Grade IIIc |
| 37610 | CHA060 | Chapaudi 060 | Settlement                          | Grade IIIc |



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| 42330 | PAR-MUS 01 | Paradise-Musina 01 | Artefacts                                       | Grade IIIc |
| 37611 | CHA061     | Chapaudi 061       | Settlement                                      | Grade IIIc |
| 37612 | CHA062     | Chapaudi 062       | Settlement                                      | Grade IIIc |
| 37613 | CHA063     | Chapaudi 063       | Artefacts                                       | Grade IIIc |
| 37614 | CHA064     | Chapaudi 064       | Building  | Grade IIIc |
| 37616 | CHA066     | Chapaudi 066       | Structures                                      | Grade IIIc |
| 37617 | CHA067     | Chapaudi 067       | Structures                                      | Grade IIIc |
| 37618 | CHA068     | Chapaudi 068       | Monuments & Memorials                           | Grade IIIa |
| 37619 | CHA069     | Chapaudi 069       | Structures, Artefacts                           | Grade IIIc |
| 37620 | CHA070     | Chapaudi 070       | Monuments & Memorials                           | Grade IIIa |
| 37622 | CHA071     | Chapaudi 071       | Burial Grounds & Graves, Settlement,<br>Deposit | Grade IIIa |
| 37624 | CHA073     | Chapaudi 073       | Cultural Landscape                              | Grade IIIa |
| 37627 | CHA075     | Chapaudi 075       | Deposit, Settlement                             | Grade IIIc |
| 37628 | CHA076     | Chapaudi 076       | Deposit, Settlement, Artefacts                  | Grade IIIc |
| 37629 | CHA077     | Chapaudi 077       | Building, Artefacts, Deposit                    | Grade IIIc |
| 37630 | CHA078     | Chapaudi 078       | Monuments & Memorials                           | Grade IIIa |
| 37631 | CHA079     | Chapaudi 079       | Settlement, Deposit                             | Grade IIIc |
| 37632 | CHA080     | Chapaudi 080       | Burial Grounds & Graves, Settlement             | Grade IIIa |
| 37634 | CHA074     | Chapaudi 074       | Structures, Artefacts                           | Grade IIIc |
| 37639 | CHA082     | Chapaudi 082       | Monuments & Memorials                           | Grade IIIa |



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| 37640 | CHA083   | Chapaudi 083         | Building                  | Grade IIIc |
| 37641 | CHA084   | Chapaudi 084         | Building                  | Grade IIIc |
| 37642 | CHA085   | Chapaudi 085         | Natural                   | Grade IIIc |
| 37655 | MOP136   | Mopane 136           | Artefacts                 | Grade IIIc |
| 37656 | MOP137   | Mopane 137           | Artefacts                 | Grade IIIc |
| 37657 | MOP138   | Mopane 138           | Artefacts                 | Grade IIIc |
| 37658 | MOP139   | Mopane 139           | Building                  | Grade IIIc |
| 37662 | MOP141   | Mopane 141           | Archaeological            | Grade IIIa |
| 37663 | MOP142   | Mopane 142           | Archaeological            | Grade IIIa |
| 37664 | MOP143   | Mopane 143           | Artefacts                 | Grade IIIa |
| 37665 | MOP144   | Mopane 144           | Artefacts                 | Grade IIIc |
| 37666 | MOP145   | Mopane 145           | Archaeological            | Grade IIIc |
| 37667 | MOP146   | Mopane 146           | Archaeological            | Grade IIIc |
| 37668 | MOP147   | Mopane 147           | Archaeological, Artefacts | Grade IIIc |
| 37669 | MOP148   | Mopane 148           | Archaeological, Artefacts | Grade IIIc |
| 37670 | MOP149   | Mopane 149           | Archaeological, Artefacts | Grade IIIc |
| 37671 | MOP150   | Mopane 150           | Structures                | Grade IIIb |
| 85955 | MAKHA049 | Makhado Colliery 049 | Burial Grounds & Graves   | Grade IIIa |
| 37674 | MOP151   | Mopane 151           | Structures                | Grade IIIc |
| 37675 | MOP152   | Mopane 152           | Building                  | Grade IIIb |
| 37677 | MOP154   | Mopane 154           | Archaeological            | Grade IIIc |

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| 37679 | MOP155   | Mopane 155           | Archaeological            | Grade IIIc |
| 37680 | MOP153   | Mopane 153           | Building                  | Grade IIIb |
| 37681 | MOP156   | Mopane 156           | Archaeological            | Grade IIIa |
| 37400 | CHA002   | Chapaudi 002         | Settlement, Artefacts     | Grade IIIa |
| 37401 | CHA003   | Chapaudi 003         | Monuments & Memorials     | Grade IIIa |
| 37402 | CHA004   | Chapaudi 004         | Stone walling             | Grade IIIa |
| 37403 | CHA005   | Chapaudi 005         | Stone walling, Settlement | Grade IIIa |
| 37404 | CHA006   | Chapaudi 006         | Structures                | Grade IIIc |
| 37409 | MOP001   | Mopane 001           | Artefacts                 | Grade IIIa |
| 37412 | CHA013   | Chapaudi 013         | Archaeological            | Grade IIIc |
| 37414 | CHA014   | Chapaudi 014         | Stone walling             | Grade IIIc |
| 37415 | MOP003   | Mopane 003           | Building                  | Grade IIIc |
| 37417 | CHA016   | Chapaudi 016         | Stone walling             | Grade IIIc |
| 37419 | CHA015   | Chapaudi 015         | Cultural Landscape        | Grade IIIb |
| 37420 | MOP004   | Mopane 004           | Cultural Landscape        | Grade IIIb |
| 37422 | MOP005   | Mopane 005           | Cultural Landscape        | Grade IIIb |
| 37423 | CHA017   | Chapaudi 017         | Artefacts                 | Grade IIIc |
| 37424 | MOP006   | Mopane 006           | Building                  | Grade IIIb |
| 37429 | CHA020   | Chapaudi 020         | Stone walling, Artefacts  | Grade IIIb |
| 37431 | CHA019   | Chapaudi 019         | Artefacts                 | Grade IIIc |
| 85961 | MAKHA055 | Makhado Colliery 055 | Structures                | Grade IIIc |

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|       |        |              |                         |            |
|-------|--------|--------------|-------------------------|------------|
| 37488 | MOP051 | Mopane 051   | Burial Grounds & Graves | Grade IIIa |
| 37490 | MOP053 | Mopane 053   | Burial Grounds & Graves | Grade IIIb |
| 37506 | MOP069 | Mopane 069   | Burial Grounds & Graves | Grade IIIa |
| 37510 | MOP073 | Mopane 073   | Burial Grounds & Graves | Grade IIIa |
| 37515 | MOP078 | Mopane 078   | Burial Grounds & Graves | Grade IIIa |
| 37516 | MOP079 | Mopane 079   | Burial Grounds & Graves | Grade IIIa |
| 37517 | MOP080 | Mopane 080   | Burial Grounds & Graves | Grade IIIa |
| 37526 | MOP084 | Mopane 084   | Burial Grounds & Graves | Grade IIIa |
| 37530 | MOP086 | Mopane 086   | Burial Grounds & Graves | Grade IIIa |
| 37532 | CHA035 | Chapaudi 035 | Burial Grounds & Graves | Grade IIIa |
| 37544 | MOP093 | Mopane 093   | Burial Grounds & Graves | Grade IIIa |
| 37545 | MOP094 | Mopane 094   | Burial Grounds & Graves | Grade IIIa |
| 37554 | MOP103 | Mopane 103   | Burial Grounds & Graves | Grade IIIa |
| 37565 | MOP112 | Mopane 112   | Burial Grounds & Graves | Grade IIIa |
| 37582 | MOP121 | Mopane 121   | Burial Grounds & Graves | Grade IIIa |
| 37583 | CHA046 | Chapaudi 046 | Burial Grounds & Graves | Grade IIIa |
| 37588 | MOP124 | Mopane 124   | Burial Grounds & Graves | Grade IIIa |
| 37589 | CHA047 | Chapaudi 047 | Burial Grounds & Graves | Grade IIIa |
| 37590 | MOP125 | Mopane 125   | Burial Grounds & Graves | Grade IIIa |
| 37458 | MOP033 | Mopane 033   | Burial Grounds & Graves | Grade IIIa |
| 37601 | CHA051 | Chapaudi 051 | Burial Grounds & Graves | Grade IIIa |



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|       |            |                      |                         |            |
|-------|------------|----------------------|-------------------------|------------|
| 37607 | CHA057     | Chapaudi 057         | Burial Grounds & Graves | Grade IIIa |
| 42331 | PAR-MUS 02 | Paradise-Musina 02   | Burial Grounds & Graves | Grade IIIa |
| 42332 | PAR-MUS 03 | Paradise-Musina 03   | Burial Grounds & Graves | Grade IIIa |
| 37615 | CHA065     | Chapaudi 065         | Burial Grounds & Graves | Grade IIIa |
| 37633 | CHA072     | Chapaudi 072         | Burial Grounds & Graves | Grade IIIa |
| 37638 | CHA081     | Chapaudi 081         | Burial Grounds & Graves | Grade IIIa |
| 37659 | MOP140     | Mopane 140           | Burial Grounds & Graves | Grade IIIa |
| 37413 | MOP002     | Mopane 002           | Burial Grounds & Graves | Grade IIIa |
| 85954 | MAKHA048   | Makhado Colliery 048 | Burial Grounds & Graves | Grade IIIa |
| 85956 | MAKHA050   | Makhado Colliery 050 | Artefacts               | Grade IIIc |
| 85957 | MAKHA051   | Makhado Colliery 051 | Artefacts               | Grade IIIc |
| 85958 | MAKHA052   | Makhado Colliery 052 | Artefacts               | Grade IIIc |
| 85959 | MAKHA053   | Makhado Colliery 053 | Stone walling           | Grade IIIc |
| 85960 | MAKHA054   | Makhado Colliery 054 | Artefacts               | Grade IIIc |
| 85966 | MAKHA056   | Makhado Colliery 056 | Artefacts               | Grade IIIc |
| 85967 | MAKHA057   | Makhado Colliery 057 | Burial Grounds & Graves | Grade IIIa |
| 85968 | MAKHA058   | Makhado Colliery 058 | Burial Grounds & Graves | Grade IIIa |
| 85969 | MAKHA059   | Makhado Colliery 059 | Artefacts               | Grade IIIc |
| 85970 | MAKHA060   | Makhado Colliery 060 | Archaeological          | Grade IIIc |
| 85971 | MAKHA061   | Makhado Colliery 061 | Artefacts               | Grade IIIc |
| 85972 | MAKHA062   | Makhado Colliery 062 | Burial Grounds & Graves | Grade IIIb |

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|       |              |                                       |                              |            |
|-------|--------------|---------------------------------------|------------------------------|------------|
| 85973 | MAKHA063     | Makhado Colliery 063                  | Artefacts                    | Grade IIIc |
| 86030 | MAKHA086     | Makhado Colliery 086                  | Living Heritage/Sacred sites | Grade IIIa |
| 26785 | 9/2/240/0005 | Verdun Ruins, Vedun, Messina District | Archaeological               | Grade II   |

## APPENDIX 2

### Reference List

| Heritage Impact Assessments |             |                                   |            |  |
|-----------------------------|-------------|-----------------------------------|------------|--|
| Nid                         | Report Type | Author/s                          | Date       | Title  |
| 45126                       | HIA         | Frans Roodt                       | 01/10/2011 | ESKOM POWER LINE PARADISE SUBSTATION TO THE PROPOSED MAKHADO COLLIERY  |
| 153337                      | HIA         | Matodzi Silidi, Innocent Pikirayi | 04/10/2013 | The attached report is a Heritage Impact Assessment (HIA) for the Mopane Project Area which describes potential adverse and positive effects of the proposed mining operations on heritage resources. The Impact Assessment has been carried out in accordance |
| 153366                      | HIA         | Matodzi Silidi, Innocent Pikirayi | 18/11/2013 | The report is a Heritage Impact Assessment (HIA) for the Chapudi Project area which describes potential adverse and positive effects of the proposed mining operations on heritage resources. The report builds on a scoping survey conducted earlier and adds |
| 291265                      | HIA         | Frans Roodt                       | 30/11/2015 | PHASE 1 HERITAGE IMPACT ASSESSMENT REPORT. THE DUEL 186 MT Remaining Extent, VHEMBE DISTRICT MUNICIPALITY, LIMPOPO   |

## APPENDIX 3 - Keys/Guides

### Key/Guide to Acronyms

|               |  |
|---------------|--|
| <b>AIA</b>    | Archaeological Impact Assessment   |
| <b>DARD</b>   | Department of Agriculture and Rural Development (KwaZulu-Natal)                      |
| <b>DEA</b>    | Department of Environmental Affairs  |
| <b>DEADP</b>  | Department of Environmental Affairs and Development Planning (Western Cape)          |
| <b>DEDEAT</b> | Department of Economic Development, Environmental Affairs and Tourism (Eastern Cape) |

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|               |  |
|---------------|--|
| <b>DEDECT</b> | Department of Economic Development, Environment, Conservation and Tourism (North West) |
| <b>DEDT</b>   | Department of Economic Development and Tourism (Mpumalanga)                            |
| <b>DEDTEA</b> | Department Of economic Development, Tourism And Environmental Affairs (free State)     |
| <b>Denc</b>   | Department Of Environment And Nature Conservation (northern Cape)                      |
| <b>DMR</b>    | Department of Mineral Resources  |
| <b>Gdard</b>  | Gauteng Department Of Agriculture And Rural Development (gauteng)                      |
| <b>HIA</b>    | Heritage Impact Assessment   |
| <b>Ledet</b>  | Department Of Economic Development, Environment and Tourism (Limpopo)                  |
| <b>MPRDA</b>  | Mineral and Petroleum Resources Development Act, no 28 of 2002                         |
| <b>NEMA</b>   | National Environmental Management Act, no 107 of 1998                                  |
| <b>NHRA</b>   | National Heritage Resources Act, no 25 of 1999   |
| <b>PIA</b>    | Palaeontological Impact Assessment   |
| <b>SAHRA</b>  | South African Heritage Resources Agency  |
| <b>SAHRIS</b> | South African Heritage Resources Information System                                    |
| <b>VIA</b>    | Visual Impact Assessment   |

### Full guide to Palaeosensitivity Map legend

|  |                       |  |
|--|-----------------------|--|
|  | <b>RED:</b>           | VERY HIGH - field assessment and protocol for finds is required  |
|  | <b>ORANGE/YELLOW:</b> | HIGH - desktop study is required and based on the outcome of the desktop study, a field assessment is likely |
|  | <b>GREEN:</b>         | MODERATE - desktop study is required   |
|  | <b>BLUE/PURPLE:</b>   | LOW - no palaeontological studies are required however a protocol for chance finds is required               |
|  | <b>GREY:</b>          | INSIGNIFICANT/ZERO - no palaeontological studies are required  |
|  | <b>WHITE/CLEAR:</b>   | UNKNOWN - these areas will require a minimum of a desktop study.   |

## APPENDIX 4 - Methodology

The Heritage Screener summarises the heritage impact assessments and studies previously undertaken within the area of the proposed development and its surroundings. Heritage resources identified in these reports are assessed by our team during the screening process.

The heritage resources will be described both in terms of **type**:

- Group 1: Archaeological, Underwater, Palaeontological and Geological sites, Meteorites, and Battlefields

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- Group 2: Structures, Monuments and Memorials
- Group 3: Burial Grounds and Graves, Living Heritage, Sacred and Natural sites
- Group 4: Cultural Landscapes, Conservation Areas and Scenic routes

and **significance** (Grade I, II, IIIa, b or c, ungraded), as determined by the author of the original heritage impact assessment report or by formal grading and/or protection by the heritage authorities.

Sites identified and mapped during research projects will also be considered.

#### **DETERMINATION OF THE EXTENT OF THE INCLUSION ZONE TO BE TAKEN INTO CONSIDERATION**

The extent of the inclusion zone to be considered for the Heritage Screener will be determined by CTS based on:

- the size of the development,
- the number and outcome of previous surveys existing in the area
- the potential cumulative impact of the application.

The inclusion zone will be considered as the region within a maximum distance of 50 km from the boundary of the proposed development.

#### **DETERMINATION OF THE PALAEOLOGICAL SENSITIVITY**

The possible impact of the proposed development on palaeontological resources is gauged by:

- reviewing the fossil sensitivity maps available on the South African Heritage Resources Information System (SAHRIS)
- considering the nature of the proposed development
- when available, taking information provided by the applicant related to the geological background of the area into account

#### **DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON**

Each report assessed for the compilation of the Heritage Screener is colour-coded according to the level of coverage accomplished. The extent of the surveyed coverage is labeled in three categories, namely low, medium and high. In most instances the extent of the map corresponds to the extent of the development for which the specific report was undertaken.

**Low coverage** will be used for:

- desktop studies where no field assessment of the area was undertaken;
- reports where the sites are listed and described but no GPS coordinates were provided.
- older reports with GPS coordinates with low accuracy ratings;



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- reports where the entire property was mapped, but only a small/limited area was surveyed.
- uploads on the National Inventory which are not properly mapped.

**Medium coverage** will be used for

- reports for which a field survey was undertaken but the area was not extensively covered. This may apply to instances where some impediments did not allow for full coverage such as thick vegetation, etc.
- reports for which the entire property was mapped, but only a specific area was surveyed thoroughly. This is differentiated from low ratings listed above when these surveys cover up to around 50% of the property.

**High coverage** will be used for

- reports where the area highlighted in the map was extensively surveyed as shown by the GPS track coordinates. This category will also apply to permit reports.

## RECOMMENDATION GUIDE

The Heritage Screener includes a set of recommendations to the applicant based on whether an impact on heritage resources is anticipated. One of three possible recommendations is formulated:

**(1) The heritage resources in the area proposed for development are sufficiently recorded** - The surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

This recommendation is made when:

- enough work has been undertaken in the area
- it is the professional opinion of CTS that the area has already been assessed adequately from a heritage perspective for the type of development proposed

**(2) The heritage resources and the area proposed for development are only partially recorded** - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for the proposed development.

This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken in the area
- undertaking mitigation measures requested in previous assessments/records of decision.

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**(3) The heritage resources within the area proposed for the development have not been adequately surveyed yet - Few or no surveys have been undertaken in the area proposed for development. A full Heritage Impact Assessment with a detailed field component is recommended for the proposed development.**

**Note:**

The responsibility for generating a response detailing the requirements for the development lies with the heritage authority. However, since the methodology utilised for the compilation of the Heritage Screeners is thorough and consistent, contradictory outcomes to the recommendations made by CTS should rarely occur. Should a discrepancy arise, CTS will immediately take up the matter with the heritage authority to clarify the dispute.

The compilation of the Heritage Screener will not include any field assessment. The Heritage Screener will be submitted to the applicant within 24 hours from receipt of full payment. **If the 24-hour deadline is not met by CTS, the applicant will be refunded in full.**

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## APPENDIX 2: Archaeological Field Assessment



# SPECIALIST ARCHAEOLOGICAL FIELD REPORT

Report on a site inspection conducted for the  
**PROPOSED NEW POWER STATION NEAR MAKHADO,  
LIMPOPO**

Prepared by CTS Heritage



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In Association with Savannah Environmental

February 2017



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## EXECUTIVE SUMMARY

Savannah Environmental has been tasked with conducting environmental assessments for a proposed new power station near Makhado in Limpopo Province. Three Farms have been identified as possible alternatives for the location of this proposed power station. These are Farm Vriendin 589, Farm Du Toit 563 and Farm Battle 585.

This report constitutes a fieldwork report and is not an HIA in terms of section 38(3) of the NHRA. It is anticipated that an HIA will be drafted once the final location of the proposed power station has been determined. The fieldwork took place from 23 January to 26 January 2017. The archaeological foot survey of Farm Vriendin 589 was conducted in the company of other specialists which somewhat limited the freedom of movement of the archaeologist. The foot survey of the Farm Du Toit 563, however, was unimpeded. Unfortunately, the archaeologist was unable to access the Farm Battle 585, however it is understood that the context of Farm Battle 585 is similar to that of Farm Vriendin 589.

The most significant findings from this assessment include Site V04, the Baobab Room, graded IIIA, and Sites D04 to D07 which appear to be a Middle Stone Age artefact manufacturing site. These sites extend and blend into one another forming one large site. The density of flakes and flaked pieces that occur within this larger site is very high, with the ground surface littered with Middle Stone Age artefacts and individual instances of manufacture.. It is proposed that this larger artefact manufacturing site be graded IIIA due to its high level of scientific cultural significance.

In summary, it is recommended that:

- Farm Battle 585 requires a detailed assessment to be conducted, however it is likely that the archaeological context of this farm is similar to that of Vriendin 589
- Site V04 must not be impacted by any proposed development. A buffer of 100m around this site must be implemented.
- Sites D04 to D07 likely represents one large MSA artefact manufacturing site and must not be impacted by any proposed development. A buffer of 100m around this large artefact manufacturing site must be implemented.
- The final location of the area proposed for development should be assessed in detail by an archaeologist.

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  - 1.2 Description of Property and affected Environment
2. METHODOLOGY
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3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT
  - 3.1 Definition of the Property
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  - 4.1 Details of sites
  - 4.2 Photographic Record
  - 4.3 Mapping and spatialisation of heritage resources
5. ASSESSMENT OF IMPACTS...
6. DISCUSSION OF SIGNIFICANCE
7. CONCLUSIONS AND RECOMMENDATIONS

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## 1. INTRODUCTION

### 1.1 Background Information on Project

Savannah Environmental has been tasked with conducting environmental assessments for a proposed new power station near Makhado in Limpopo Province. Three Farms have been identified as possible alternatives for the location of this proposed power station. These are Farm Vriendin 589, Farm Du Toit 563 and Farm Battle 585.

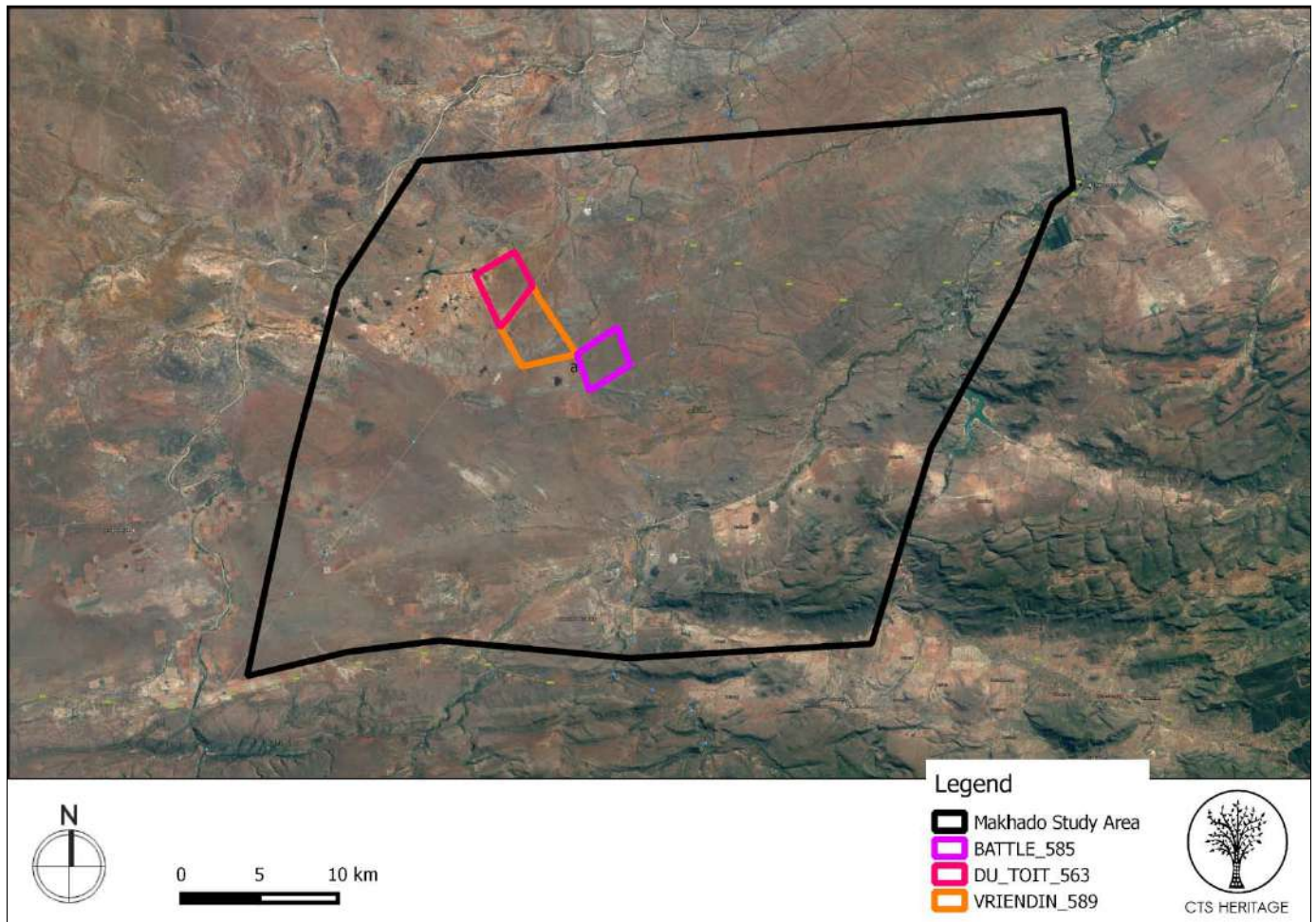


Figure 1: A portion of Farm 814/1 and a portion of remainder Farm 830 with the proposed development indicated

Prior to this field assessment, CTS Heritage conducted a desktop heritage screening assessment for the broad area under investigation (Annexure 1). The results of this assessment concluded that:

“The large screening study area consists of cultivated land, towns as well as infrastructure such as National roads and a nature reserve. CTS Heritage was requested to provide an overview of the known heritage resources within this area as well as the areas of likely heritage sensitivity to inform



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the selection of project locality alternatives. The screening study area for this proposed new power station is rich in heritage resources including areas that have high to very high sensitivity for palaeontological resources. Any proposed development that impacts on these sensitive areas will require a full palaeontological assessment as well as a protocol for chance finds. In terms of archaeological resources, significant Stone Age and Iron Age resources are known from this area (see maps 3a to 3e above as well as Appendix 1). In the above maps, the areas which appear to be void of archaeological resources **have not yet been systematically surveyed** and as such, will require detailed field analysis as part of any additional heritage studies that will be completed for this project. This area is also known for its numerous informal burial grounds and graves. These are spaces that are sacred to the communities that live here and should be accorded the appropriate respect. It is important to note that any location selected within this larger screening area will likely require further heritage assessment in terms of likely impact to archaeological resources and informal burial grounds due to the sensitivity of the region."

Savannah Environmental requested a field assessment to determine the suitability of these three proposed farms for the location of the proposed Power Station.

## 1.2 Description of Property and affected Environment

The area proposed for the new Makhado Power Station is predominantly rural in nature with a number of coal mines located in the vicinity. The proposed development areas are located in the Lowveld. The area consists of savannah drylands as well as high rainfall areas. The nearby Soutpansberg has forests where the fauna and flora are abundant, and where a wide variety of animal as well as bird species can be found. The three farms each displayed evidence of agricultural activity and disturbance.

## 2. METHODOLOGY

### 2.1 Scope of Work

It is important to note that this report is not an HIA. The purpose of this Field Assessment Report is to identify any fatal flaws in terms of heritage in order to inform the decision-making process regarding the location of the proposed power station. Once the detail regarding the proposed development is finalised, this Field Assessment report will be used to inform a complete HIA in terms of section 38(3) of the NHRA.

### 2.2 Summary of steps followed

- The landowners were contacted for access to the property
- The sites were visited from Monday 23 to Thursday 26 January 2017

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- The proposed quarry area was traversed on foot in transects and any identified archaeological or other heritage resources were recorded using a digital camera and a Garmin GPS

### 3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

#### 3.1 Definition of the property

The field assessment targeted three properties in the Makhado area in the Limpopo Province.

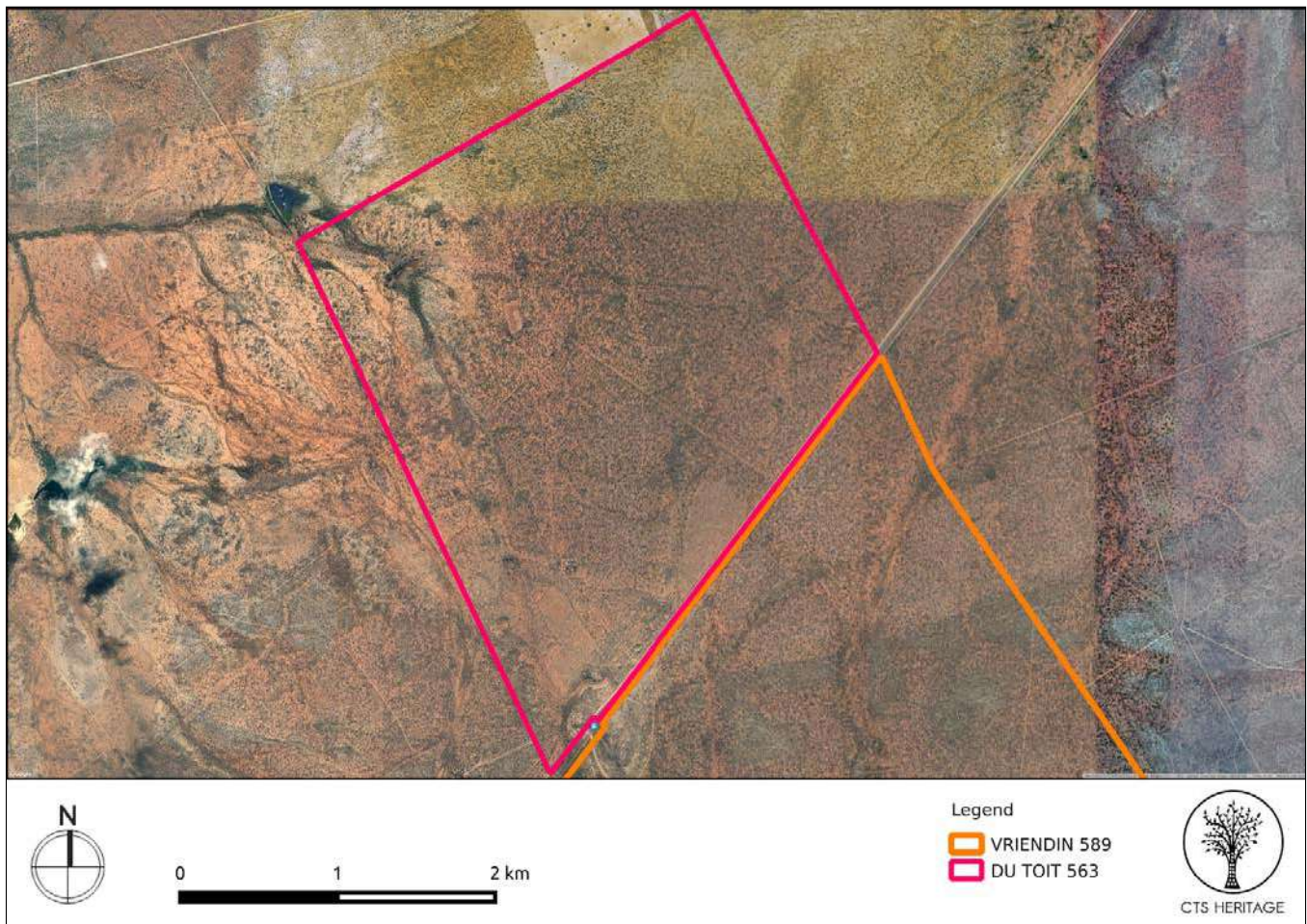
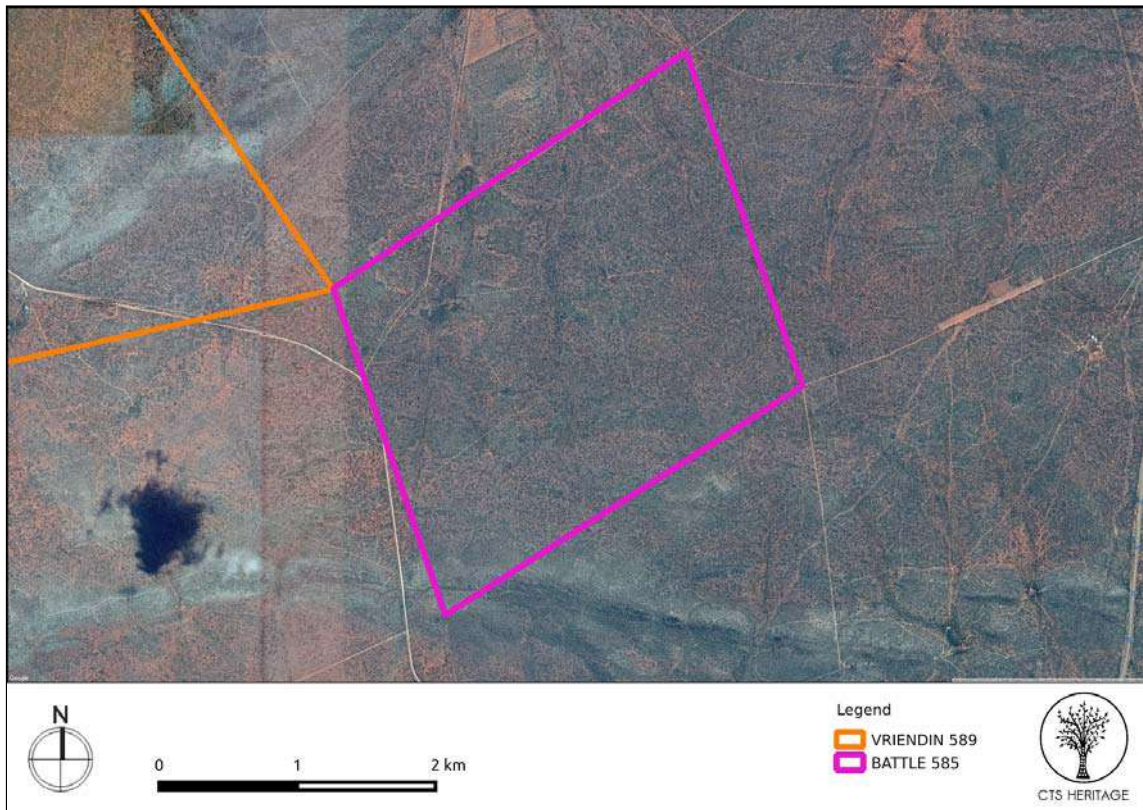
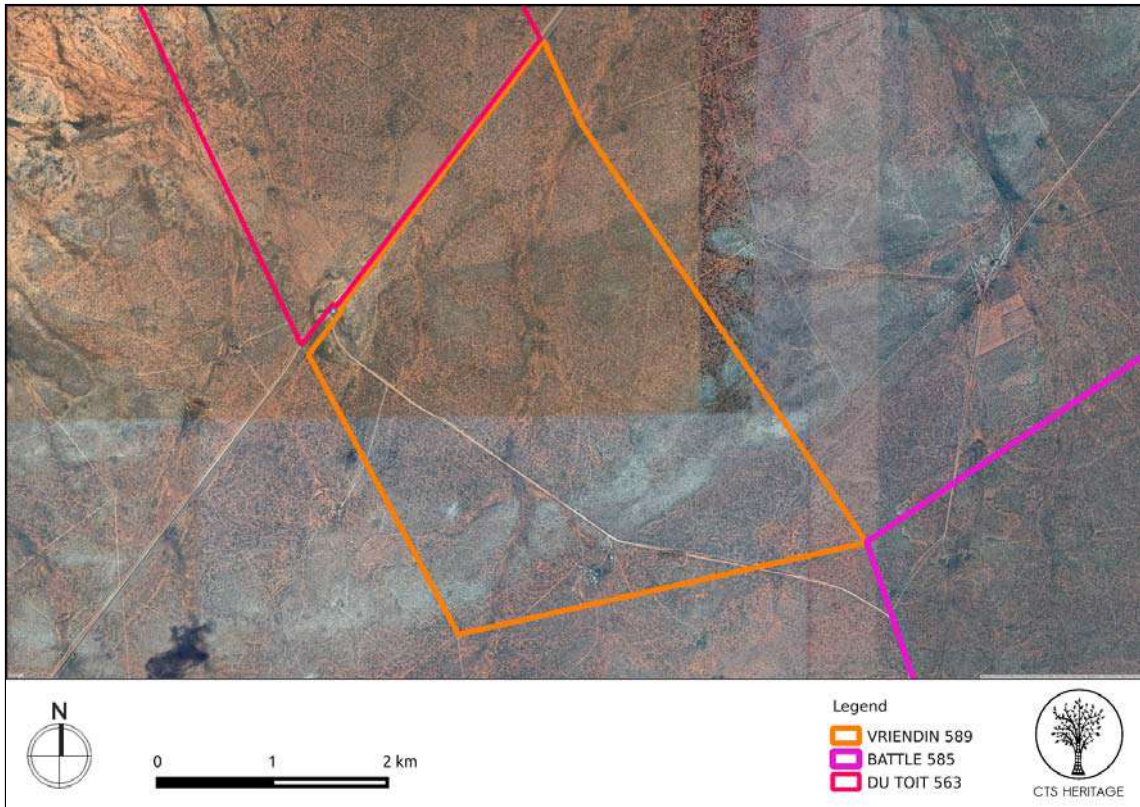


Figure 2: Aerial Image of proposed quarry area





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### 3.2 Archaeological and Historical Background

The area surrounding the three farms assessed in this field report are known for a variety of kinds of heritage resources including Stone Age archaeology, Iron Age archaeology, significant structures and living heritage sites such as significant baobab trees as well as burial grounds and graves.

South Africa has an extensive stone age archaeological record including Earlier Stone Age (approximately 2.5mya to 200 kya), Middle Stone Age (200 kya to 40 kya) and Later Stone Age (40 kya to 2000 years ago) deposits. These sites tend to present as scatters of stone age artefacts. Rarely, archaeologists may find a stone tool manufacture site with evidence of stone flake tools as well as the flaked pieces of stone.

Later Iron Age sites, such as Mapungubwe, tend to present as the remnants of Iron Age settlements identified through distinct patterns of stone features that formed the foundations of iron age structures. Often, Early Iron Age sites are not visible on the surface, but are evidenced by material culture associated with the Early Iron Age such as pottery sherds, Iron slag and other material culture located beneath the land surface.

There are numerous informal burial grounds and graves located in this area, associated with farm workers or mine workers. Often these burial grounds are not fenced and have minimal surface markings denoting their presence. These informal burial grounds and graves have a significant role to play in terms of the cultural continuity of residents of the area and care must be taken to avoid any impact to sites such as this.

**Table 1: Sites previously identified within the vicinity of the proposed power station**

| Site ID | Site No | Full Site Name | Site Type           | Grading    |
|---------|---------|----------------|---------------------|------------|
| 37464   | MOP035  | Mopane 035     | Deposit             | Grade IIIc |
| 37563   | MOP110  | Mopane 110     | Structures, Deposit | Grade IIIc |
| 37564   | MOP111  | Mopane 111     | Structures          | Grade IIIc |
| 37566   | MOP113  | Mopane 113     | Structures          | Grade IIIc |
| 37567   | MOP114  | Mopane 114     | Structures          | Grade IIIa |
| 37568   | MOP115  | Mopane 115     | Building            | Grade IIIb |
| 37455   | MOP031  | Mopane 031     | Artefacts           | Grade IIIb |
| 37456   | MOP032  | Mopane 032     | Structures          | Grade IIIc |

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|       |        |            |                         |            |
|-------|--------|------------|-------------------------|------------|
| 37459 | MOP034 | Mopane 034 | Building                | Grade IIIa |
| 37466 | MOP036 | Mopane 036 | Structures              | Grade IIIc |
| 37468 | MOP037 | Mopane 037 | Building                | Grade IIIb |
| 37565 | MOP112 | Mopane 112 | Burial Grounds & Graves | Grade IIIa |
| 37458 | MOP033 | Mopane 033 | Burial Grounds & Graves | Grade IIIa |

Table 2: HIA's previously conducted in the vicinity of the proposed power station (Figure 5)

| Nid    | Report Type | Author/s                                | Date       | Title  |
|--------|-------------|---|------------|--|
| 153337 | HIA         | Matodzi Silidi,<br>Innocent<br>Pikirayi | 04/10/2013 | The attached report is a Heritage Impact Assessment (HIA) for the Mopane Project Area which describes potential adverse and positive effects of the proposed mining operations on heritage resources. The Impact Assessment has been carried out in accordance |

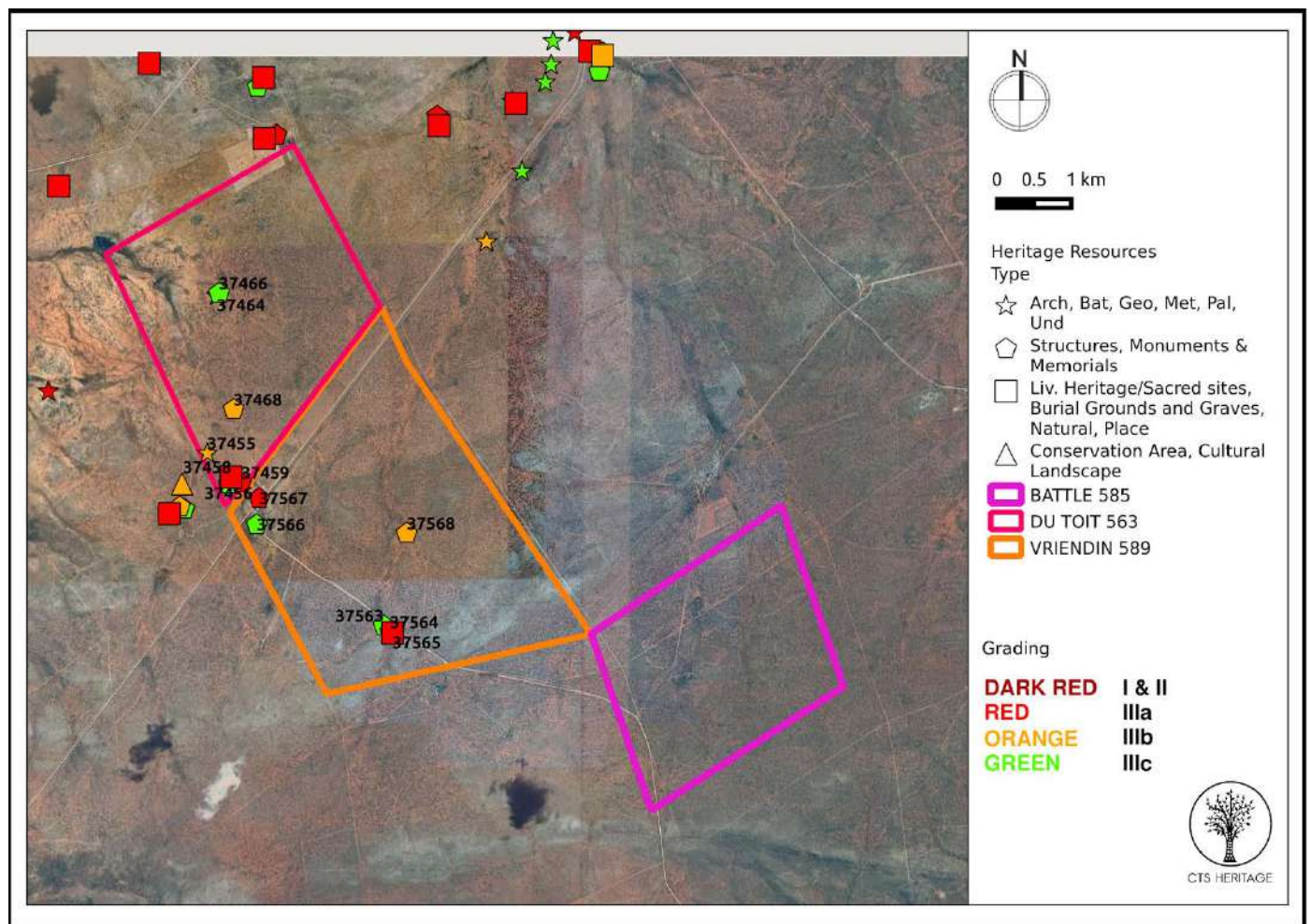


Figure 6: Spatialisation of known heritage resources in the vicinity of the proposed power station



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#### 4. DESCRIPTION OF HERITAGE RESOURCES

##### 4.1 Details of Site Visits

The fieldwork took place from 23 January to 26 January 2017. The archaeological foot survey of Farm Vriendin 589 was conducted in the company of other specialists which somewhat limited the freedom of movement of the archaeologist. The foot survey of the Farm Du Toit 563, however, was unimpeded. Unfortunately, the archaeologist was unable to access the Farm Battle 585 as the gate was locked at the time agreed to for the site visit, however it is understood that the context of Farm Battle 585 is similar to that of Farm Vriendin 589.

On both surveyed farms, the visibility was good. A number of informal dam excavations and mole rat activity provided a window into sub-surface deposits.

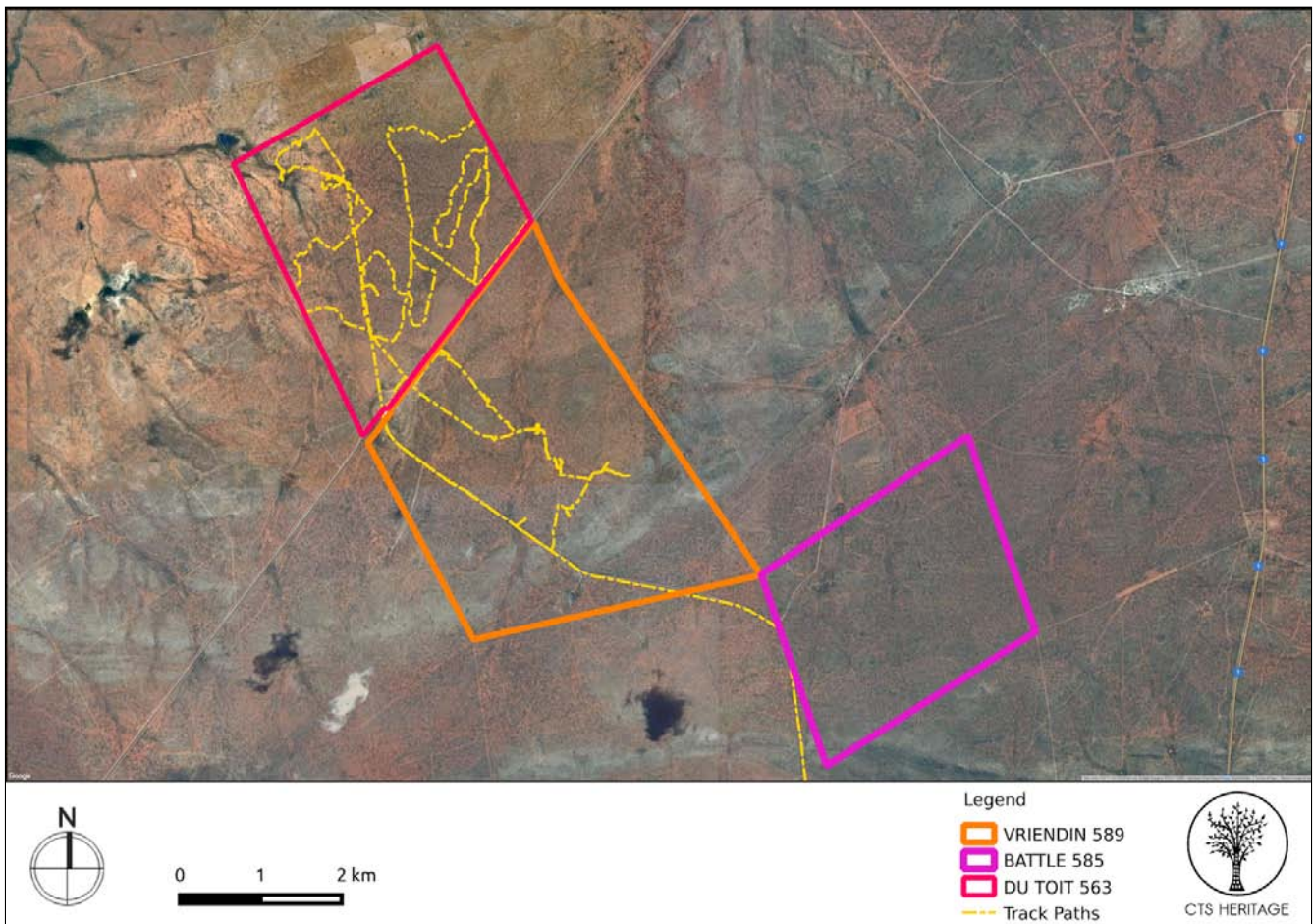


Figure 5: Map indicating the track paths walked by the archaeologist

A number of heritage resources of varied significance were identified by the archaeologist on Farms Vriendin 589 and Du Toit 563. These sites have been recorded on SAHRIS and are detailed in the table below.





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Table 3: Artefacts identified during the foot survey (NCW: Not Conservation-Worthy)

| SAHRIS Site ID | Site Number | Site Name  | Site Description  | Grading    |
|----------------|-------------|------------|---|------------|
| 105144         | V01         | Vriendin 1 | Archaeological, 1 stone artefact  | NCW        |
| 105145         | V02         | Vriendin 2 | Archaeological, 1 stone artefact  | NCW        |
| 105146         | V03         | Vriendin 3 | Modern disused agricultural infrastructure  | NCW        |
| 105147         | V04         | Vriendin 4 | Living Heritage/Sacred sites, the "Baobab Room"   | Grade IIIa |
| 105149         | V05         | Vriendin 5 | Archaeological, 1 stone artefact  | NCW        |
| 105150         | V06         | Vriendin 6 | Ruin of agricultural infrastructure   | NCW        |
| 105151         | D01         | Du Toit 1  | Modern agricultural infrastructure  | NCW        |
| 105152         | D02         | Du Toit 2  | Archaeological, 1 potsherd  | NCW        |
| 105153         | D03         | Du Toit 3  | Archaeological, potsherd and some stone tools, low density  | Grade IIIc |
| 105154         | D04         | Du Toit 4  | Archaeological, MSA stone tools identified emerging from 1x4m hole previously dug, Additional artefacts and raw material scattered on surface. High density | Grade IIIa |
| 105155         | D05         | Du Toit 5  | Archaeological, MSA stone tools raw material scattered on surface. High density   | Grade IIIa |
| 105156         | D06         | Du Toit 6  | Archaeological, MSA stone tools raw material scattered on surface. Highest density  | Grade IIIa |
| 105157         | D07         | Du Toit 7  | Archaeological, MSA stone tools raw material scattered on surface including hammerstone. High density   | Grade IIIa |
| 105159         | D08         | Du Toit 8  | Archaeological, isolated artefacts. Low density   | Grade IIIc |
| 105160         | D09         | Du Toit 9  | Archaeological, artefacts and ochre. Moderate density   | Grade IIIc |
| 105161         | D10         | Du Toit 10 | Remains of modern disused agricultural infrastructure   | NCW        |
| 105162         | D11         | Du Toit 11 | Archaeological, small dam with sporadic artefacts in spoil heap   | Grade IIIc |
| 105163         | D12         | Du Toit 12 | Archaeological, near to the boundary of Vriendin. Area cleared for powerline construction. Piece of iron slag identified.                                   | NCW        |
| 105164         | D13         | Du Toit 13 | Ruin of disused modern agricultural infrastructure  | NCW        |

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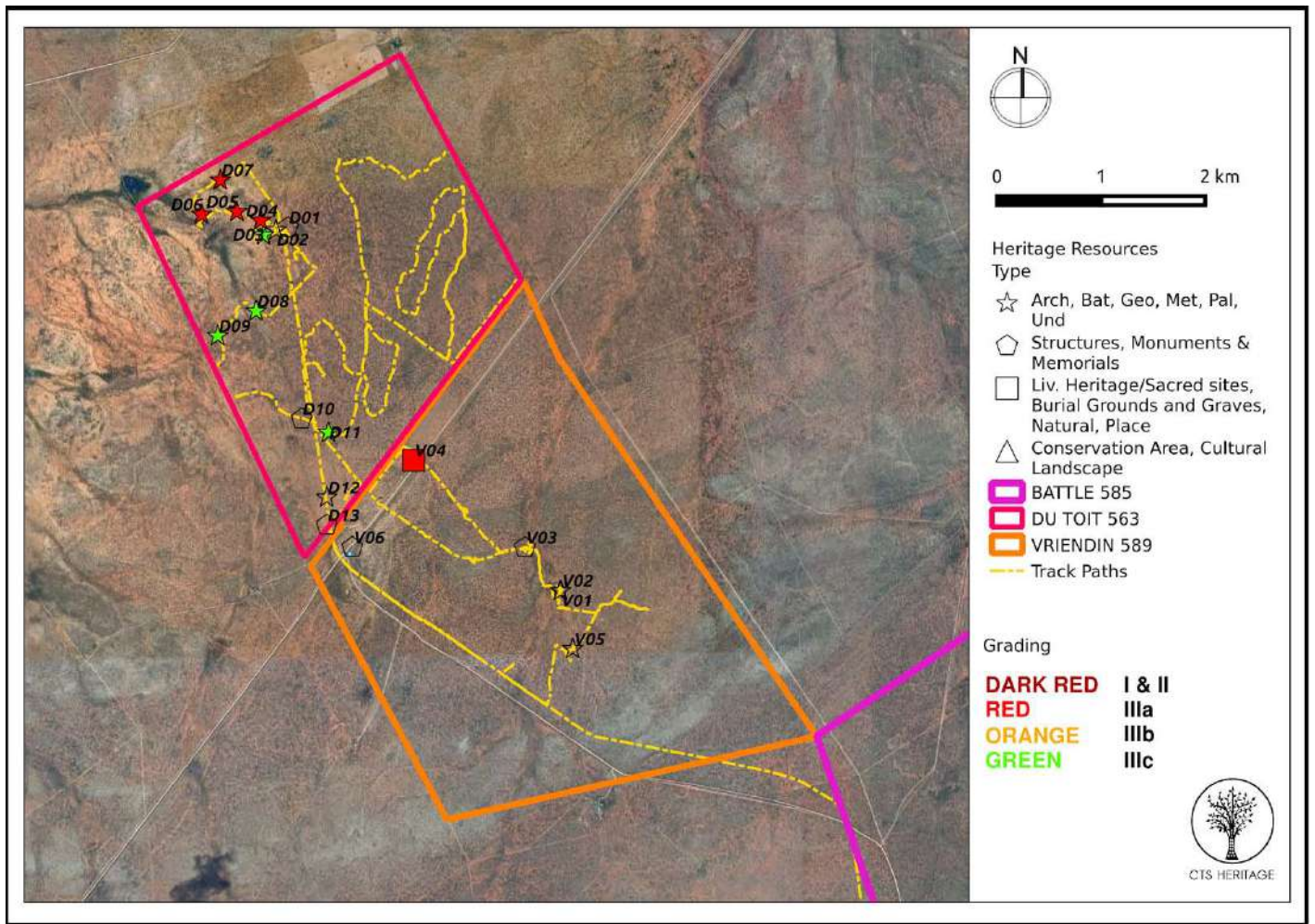


Figure 6: Map indicating location of heritage resources identified during the foot survey

#### 4.2 Photographic Record



Figure 8: Site V04, the "Baobab Room"





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Figure 9 and 10: Inside the “Baobab Room” at V04 and pegs used to assist with entry



Figure 11: Site D04 with the 1x4m pit indicated





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Figure 12: A selection of MSA artefacts from site D04



Figure 13: An example of the density of artefacts at Site D06

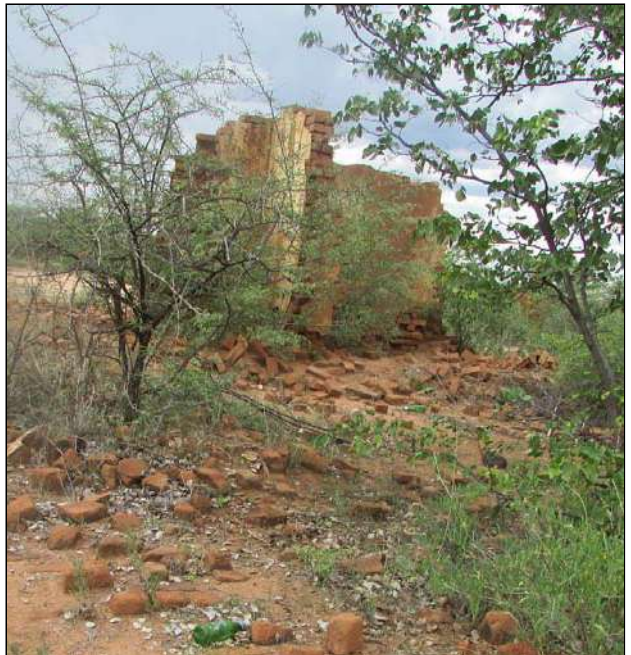




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Figures 14: Ruin of agricultural infrastructure at V06



Figures 15 and 16: Examples of disused agricultural infrastructure on Farm Du Toit 563





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#### 4.3 Mapping and spatialisation of heritage resources

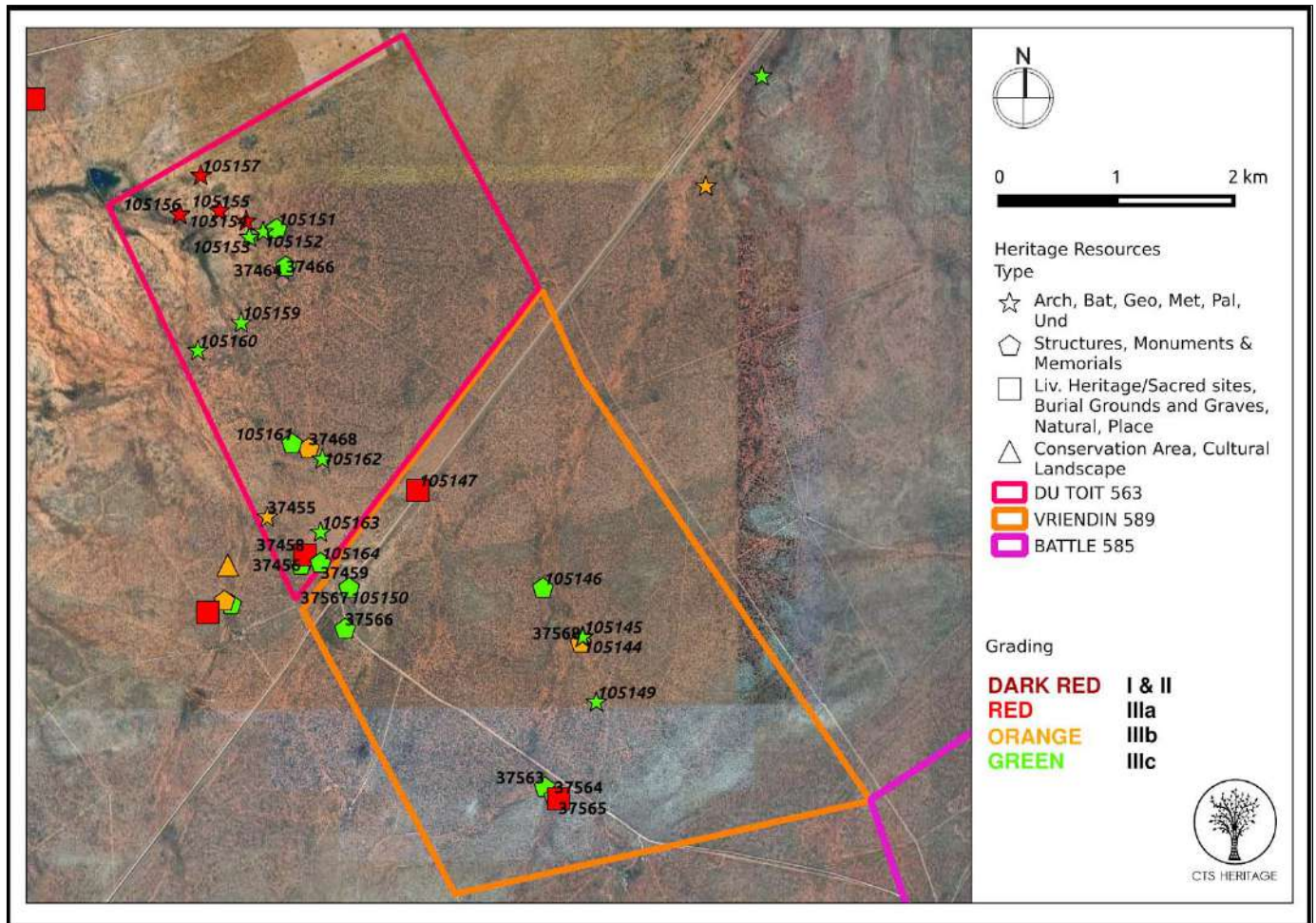


Figure 24: Spatial location of all heritage resources within the area under investigation

#### 5. DISCUSSION OF FINDINGS AND SIGNIFICANCE

The most significant findings from this assessment include Site V04, the Baobab Room, graded IIIA, and Sites D04 to D07, which for the purposes of this report should be read as one site, also graded IIIA.

The Baobab Room, Site V04, is an interesting example of living heritage that continues to be used today. The baobab, which has an entirely hollow trunk at ground level, has a number of windows that allow light into the shelter provided within the trunk. Pegs have been hammered into the external bark to facilitate access inside the tree through one of these windows. There appears to be deposit of unknown depth inside the trunk. It is proposed that this site is graded IIIA.

Sites D04 to D07 appears to be a Middle Stone Age artefact manufacturing site. These sites extend and blend into one another, forming one large site. The density of flakes and flaked pieces that



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occur within this larger site is very high, with the ground surface littered with Middle Stone Age artefacts and individual instances of manufacture. The highest density appears around site D06. Such open air Middle Stone Age sites are rare and provide a unique window into the origins of modern humans. It is proposed that this larger artefact manufacturing site be graded IIIA due to its high level of scientific cultural significance.

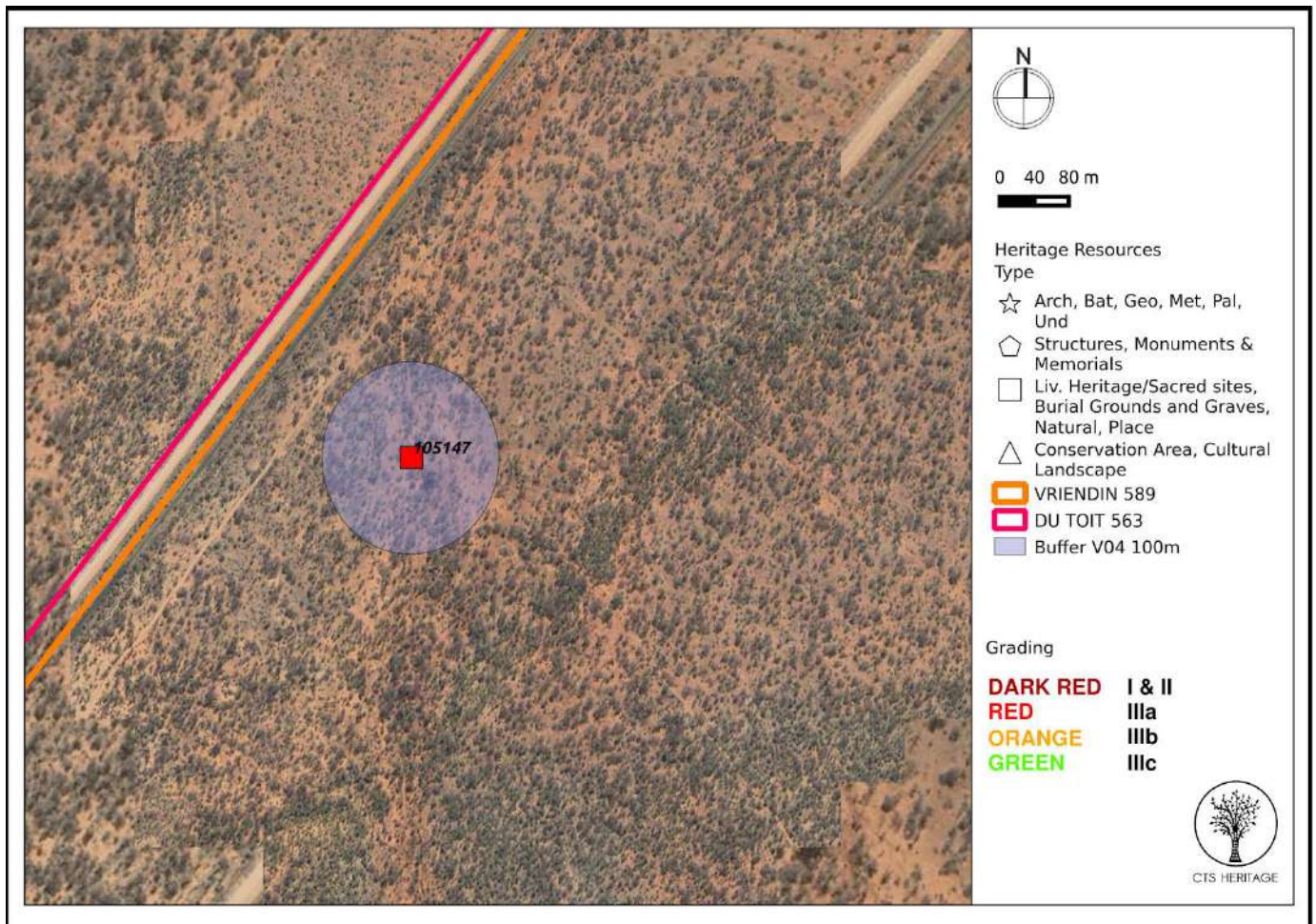


Figure 25: Site V04 with buffer zone of 100m indicated

## 6. CONCLUSION AND RECOMMENDATIONS

In light of the above findings, it is recommended that Farm Vriendin 589 is the preferred site for the proposed new power station from an archaeological perspective. It is likely that Farm Battle 585, although not assessed by the archaeologist, has a similar density and sensitivity to impacts to archaeology as Farm Vriendin 589. Site V04, the Baobab Room, must not be impacted by any proposed development and any proposed development on this farm must adhere to a buffer area of 100m around this site.





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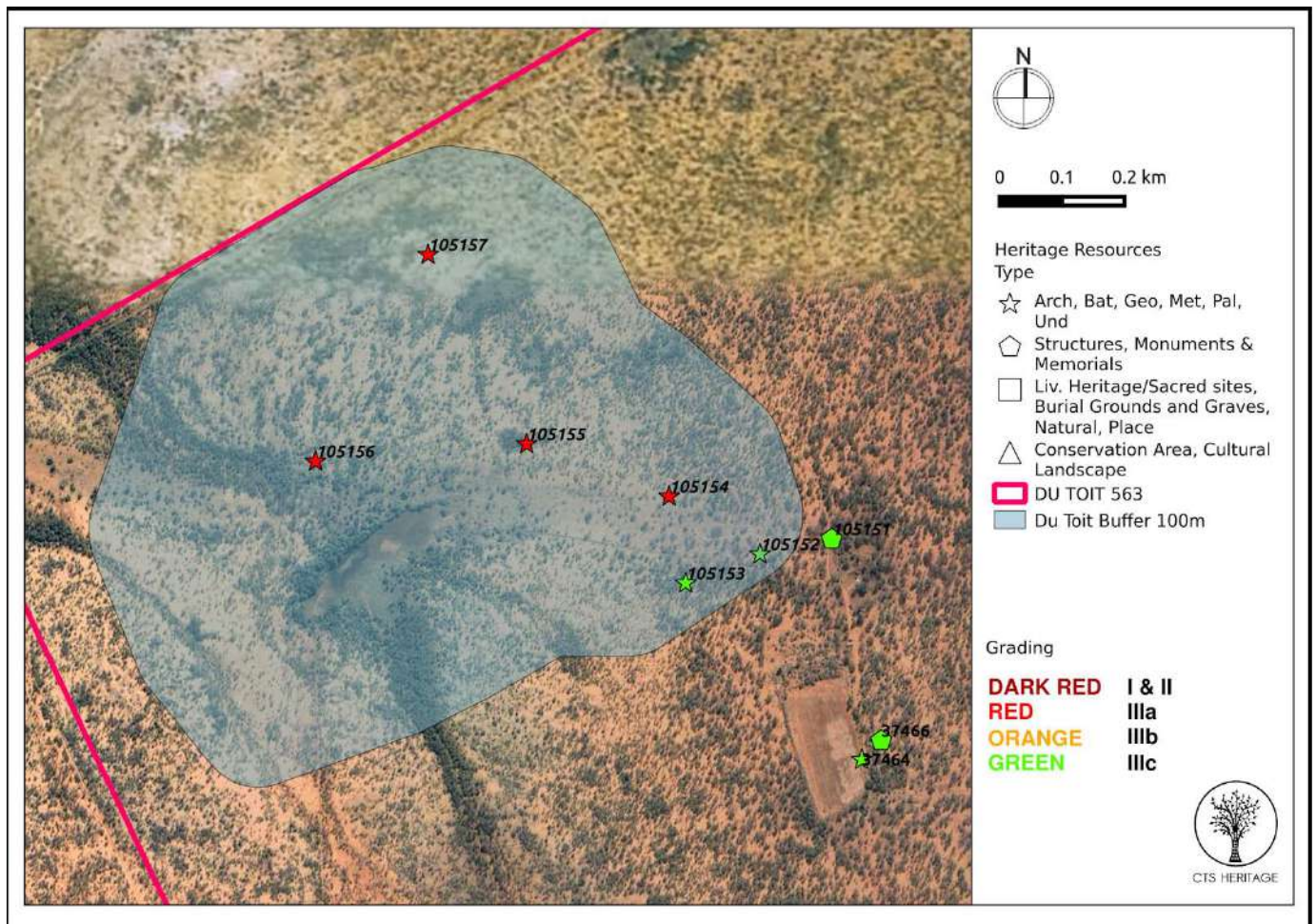


Figure 26: Sites D04 to D07 with buffer zone of 100m indicated

Farm Du Toit 563 has areas that are very significant in terms of archaeological resources, and areas that have less heritage significance. Sites D04 to D07 represent one large Middle Stone Age artefact manufacturing site that has high archaeological significance. This large, important site has valuable research potential and must be avoided by any proposed power station. Mitigation by excavation is not recommended as this would result in loss of significant archaeological information. The exact boundaries of the extent of this larger manufacturing site are not clearly determined and as such, a buffer of 100m around the visible extent of this large site be implemented should the Farm Du Toit 563 be selected as the preferred site for the proposed power station.

In summary:

- Farm Battle 585 requires a detailed assessment to be conducted, however it is likely that the archaeological context of this farm is similar to that of Vriendin 589



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- Site V04 must not be impacted by any proposed development. A buffer of 100m around this site must be implemented.
- Sites D04 to D07 likely represents one large MSA artefact manufacturing site and must not be impacted by any proposed development. A buffer of 100m around this large artefact manufacturing site must be implemented.
- The final location of the area proposed for development should be assessed in detail by an archaeologist.

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### APPENDIX 3: Palaeontological Assessment

**PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED DEVELOPMENT  
OF THE MUTSHO POWER PROJECT AND ASSOCIATED INFRASTRUCTURE ON A  
SITE NEAR MAKHADO (LOUIS TRICHARDT), LIMPOPO PROVINCE**

**Prepared for:  
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PO Box 148  
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20 January 2018

Prepared by

**BANZAI ENVIRONMENTAL (PTY) LTD**

## **EXECUTIVE SUMMARY**

Mutsho Power (Pty) Ltd proposes the development of a new coal-fired power plant and associated infrastructure on the farm Du Toit 563 and Vrienden 589 near Makhado (Louis Trichardt), in the Limpopo Province. Three alternative layouts for the development have been identified for investigation. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is key to detect the presence of fossil material within the proposed development area and it is thus necessary to evaluate the impact of the construction and operation of the development site on the palaeontological resources.

The proposed footprint is underlain by sediments of the

- Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation;
- and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement.

According to the geology of the development area, fossil heritage could be present in the Undifferentiated Karoo which has a very high Palaeontological Sensitivity as well as the Solitude Formation with a high Palaeontological Sensitivity. The Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group is metamorphic rocks which is unfossiliferous and has a very low palaeontological sensitivity. The farm Du Toit 563 is entirely underlain by the Undifferentiated Karoo and the Solitude Formation. The north eastern part of the farm Vrienden 589 falls in the potentially fossiliferous Undifferentiated Karoo and the unfossiliferous Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group. During a field survey (including all three alternative layouts) of the development footprint, no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. Irrespective of the uncommon occurrence of fossils a solitary fossil may be of scientific value as many fossil taxa are known from a single fossil. The recording of fossils will expand our knowledge of the Palaeontological Heritage of the development area.

The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Mutsho Power Project, associated infrastructure and any of the preferred layout plans will be of a low significance in palaeontological terms. It is therefore considered that the construction and operation of the Mutsho Power Project and associated infrastructure (also applicable to all three alternative layout plans) is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction and operation of the facility may be authorised as the whole extent of the development footprint is not considered sensitive in terms of palaeontological resources.

In the event that fossil remains are uncovered during any phase of construction, either on the surface or unearthed by new excavations and vegetation clearance, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (if possible *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carried out by a professional palaeontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies as required by SAHRA.



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## 1 INTRODUCTION

**Savannah Environmental (Pty) Ltd** has been appointed as the independent Environmental Consultants by Mutsho Power (Pty) Ltd for the undertaking of an integrated Environmental Impact Assessment (EIA) process in support of application for an Environmental Authorization and a Waste Management License (WML) for the proposed Mutsho Power Project located on a site near Makhado in the Limpopo Province.

Three alternative layouts for the Mutsho Power Project were identified for investigation in this process. The technically preferred layout is presented in Fig. 2 where the entire development is located on the farm Vrienden 589. With this option the ash dump is situated south of the main road on the farm Vrienden 589. The second option is presented in Fig. 3. With this option the ash dump is present on both farms, on either side of the railway and road. On the third and least preferred option the entire layout is yet again on the farm Vrienden 589 and is presented in Fig. 4. With this option the ash dump has been moved towards the centre of the development.

The proposed power station is planned to form part of the Department of Energy's (DoE's) Coal Baseload Independent Power Producer (IPP) Procurement Programme (CBIPPPP). The project will have a generation capacity of up to 660MW (export capacity below 600MW in line with DoE requirements), and will make use of Circulating Fluidised Bed (CFB) technology.

### Project Description

Information provided by the developer

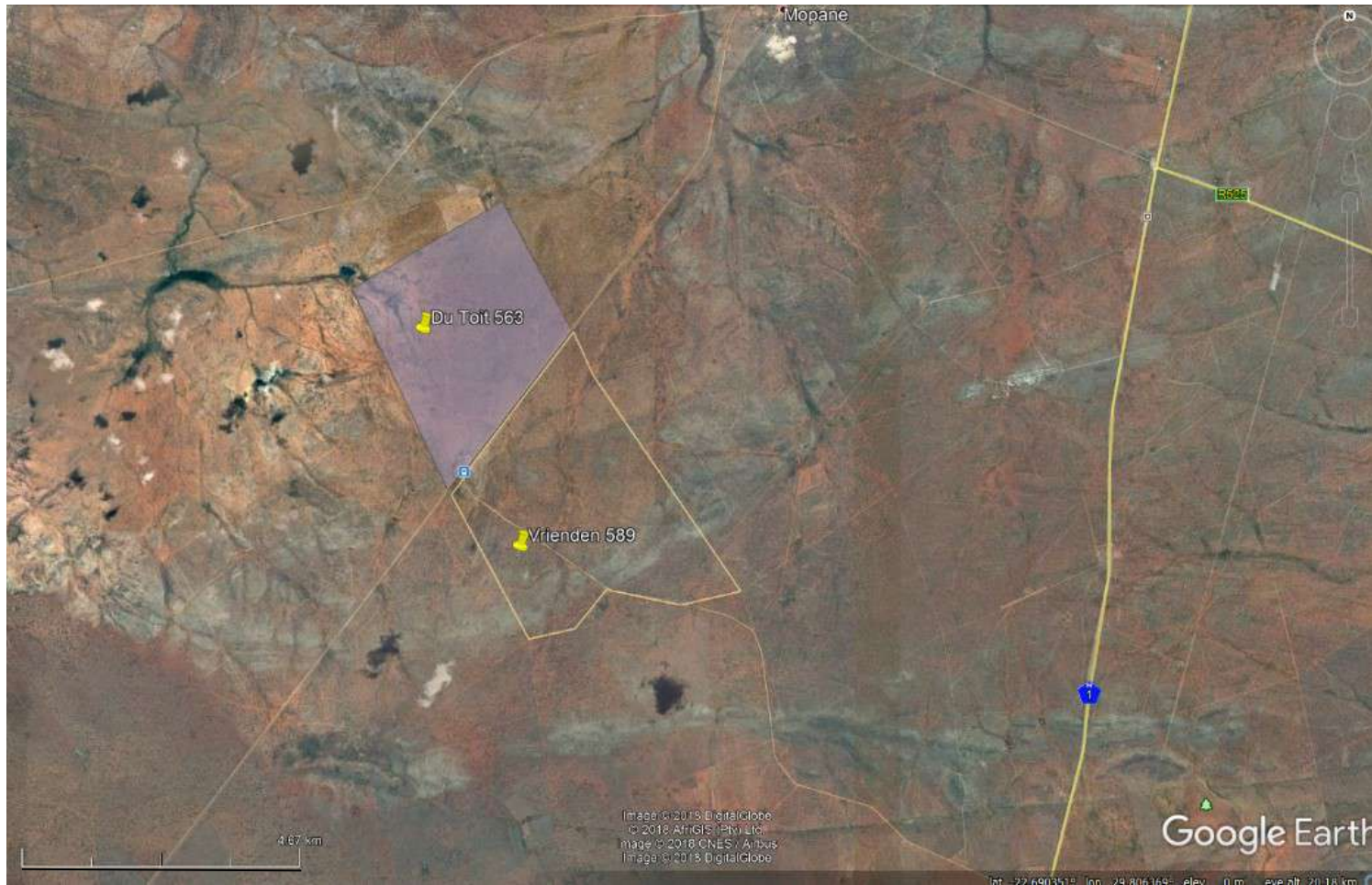
The project will consist of the following key components and associated infrastructure:

- Power island comprising of:
  - Circulating Fluidised Bed (CFB) boiler technology.
  - Electrostatic Precipitator (ESP) / Bag filtration systems and Flue / smoke stack.
  - Direct or indirect air-cooling systems.
  - Balance of plant components (incl. steam turbine and generator etc.).
- Coal and Limestone / Lime Rail Spur and-or Road offloading Systems.
- Upgrading or establishment of a rail siding.
- Coal crusher.
- Strategic and Working Coal stockpiles.
- Limestone or Lime (hydrated or de-hydrated) storage and handling.
- Ash dump (dry-ashing has been assumed for the plant in order to reduce the project's water requirements, which is in alignment with the recommendations of the National Development Plan (NDP) and Integrated Energy Plan (IEP)).
- Water infrastructure. This may include:
  - Raw water storage dams.

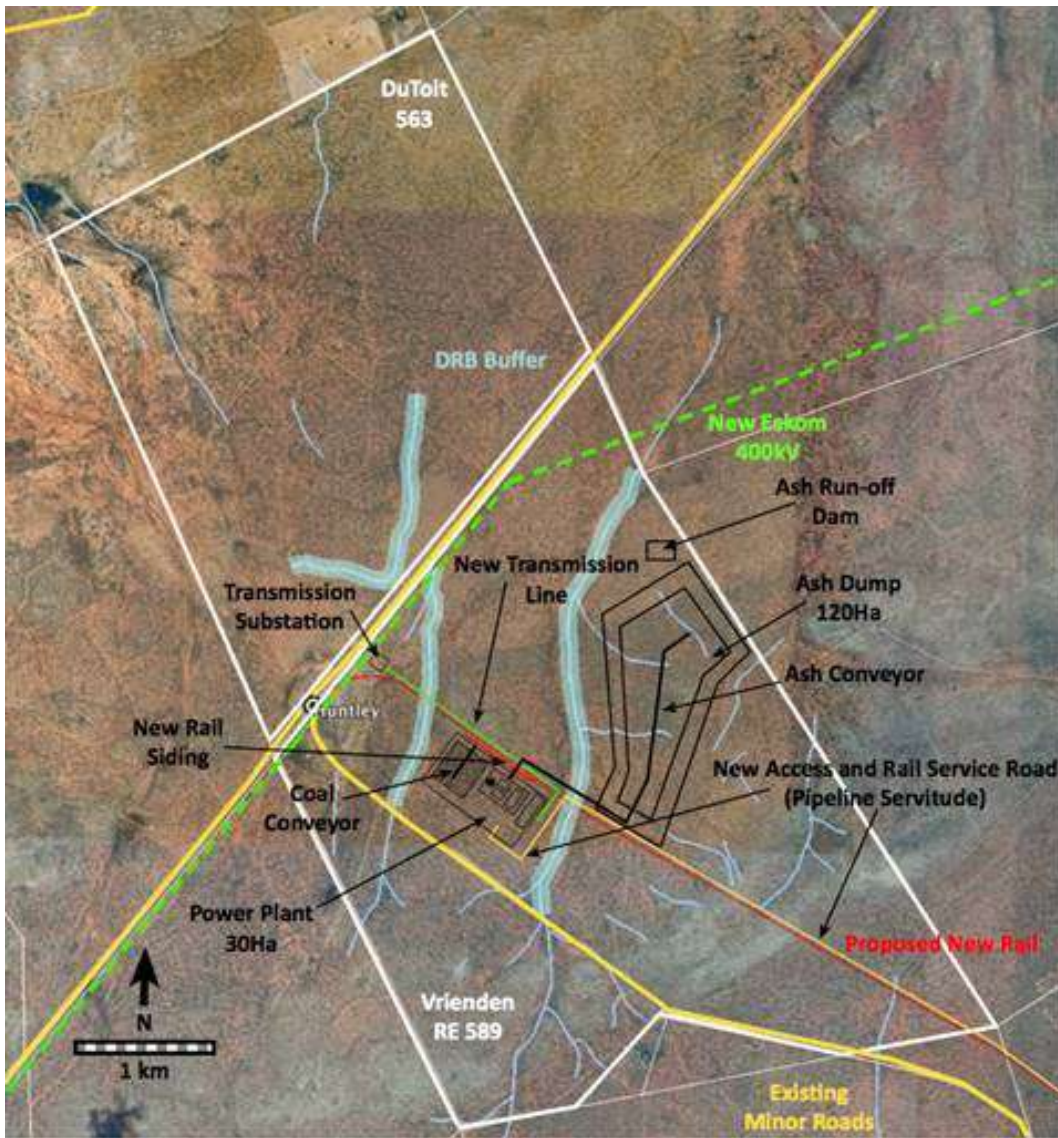
- Water supply pipelines and booster stations.
- Pollution control dam/s.
- Water treatment plant (WTP).
- Wastewater treatment plant (WWTP).
- Storm water management systems.
- HV Yard and substation components with HV overhead transmission lines connecting to the Eskom infrastructure.
- Control room, office / administration, workshop, storage and logistics buildings.
- Upgrading of external roads and establishment of internal access roads.
- Security fencing and lighting.

**Coal source / supply:** Coal mined at the Makhado Mine will be delivered to the power station either by means of a new 22km railway loop, proposed for development between the Makhado Mine and the existing Huntleigh railway siding (assessed independently as part of another project), or via road transport. The present Huntleigh siding is adjoined by both properties under investigation. Coal will then be transported via overland coal conveyor to the coal stockpile located onsite. All other raw materials will either be transported to site via rail or road transport.



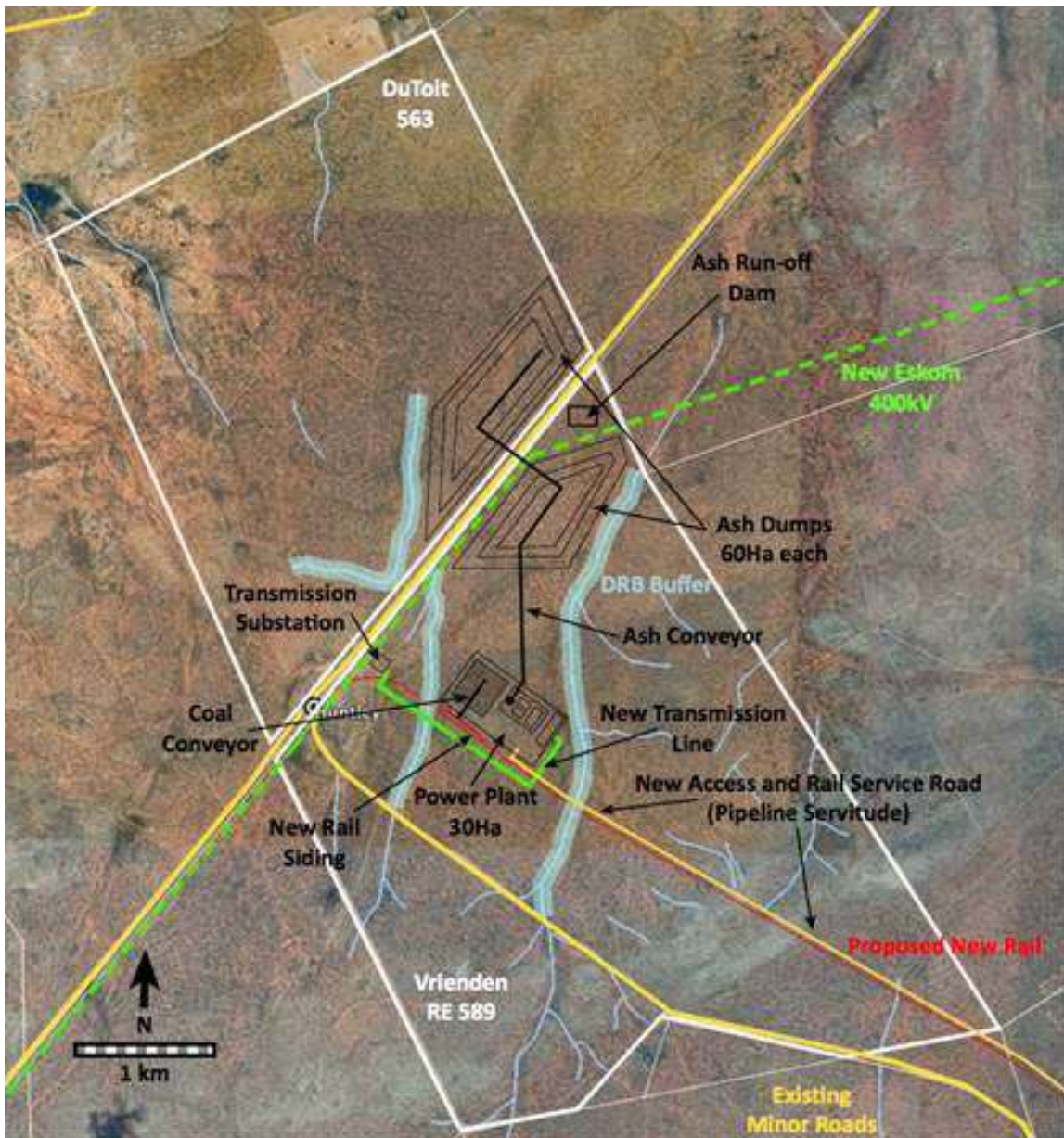


**Figure 1:** Google Earth Image (2017) of the location of the proposed Mutsho Power Project and associated infrastructure located on the farm Du Toit 563 and Vrienden 589, near Makhado, Limpopo Province. Scale bar represents 4.67 km.

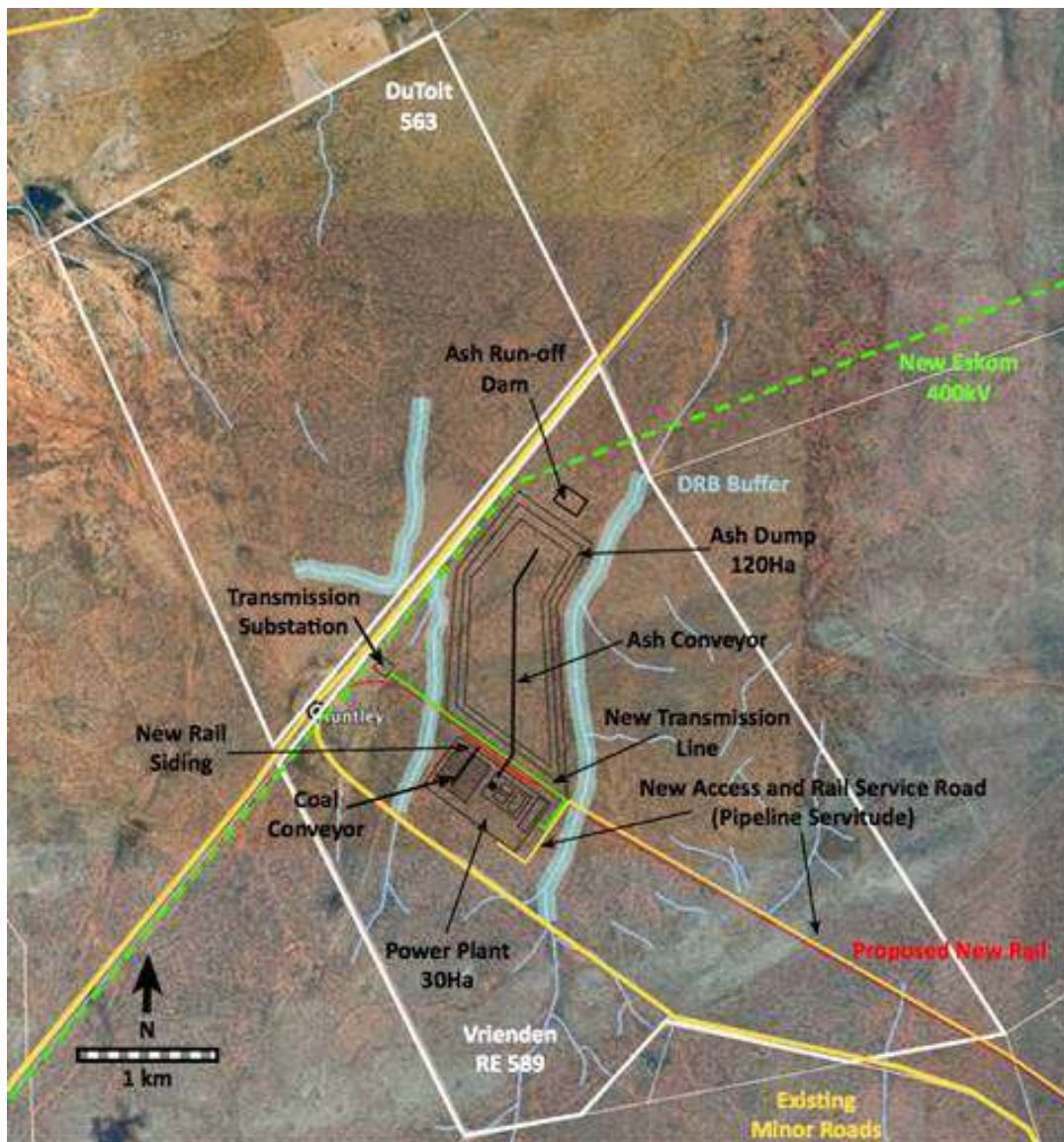


**Figure 2.** Location of the technically preferred option of the Mutsho Power Project and associated infrastructure located on the farm Du Toit 563 and Vrienden 589, near Makhado, Limpopo Province.





**Figure 3.** Location of the proposed preferred alternative of the Mutsho Power Project and associated infrastructure located on the farm Du Toit 563 and Vrienden 589, near Makhado, Limpopo Province.



**Figure 4.** Location of the proposed preferred alternative of the Mutsho Power Project and associated infrastructure located on the farm Du Toit 563 and Vrienden 589, near Makhado, Limpopo Province.

## 2 LEGISLATION

### NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

Cultural Heritage in South Africa, includes all heritage resources, and is protected by the National Heritage Resources Act (Act 25 of 1999). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**. Palaeontological heritage is unique and non-renewable and is protected by the above mentioned Act. Palaeontological resources



may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority.

This Palaeontological Environmental Impact Assessment forms part of the Heritage Impact Assessment (HIA) and adheres to the conditions of the Act. According to **Section 38**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

**ACCORDING TO SECTION 35 OF THE NATIONAL HERITAGE RESOURCES ACT 1999, DEALING WITH ARCHAEOLOGY, PALAEOLOGY AND METEORITES:**

- 35.** (1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.
- (2) Subject to the provisions of subsection (8) (a), all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.
- (3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
- (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 in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- (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 procedure 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.
- (6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or a meteorite is situated, serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.
- (7) (a) Within a period of two years from the commencement of this Act, any person in possession of any archaeological or palaeontological material or object or any meteorite which was acquired other than in terms of a permit issued in terms of this Act, equivalent provincial legislation or the National Monuments Act, 1969 (Act No. 28 of 1969), must lodge with the responsible heritage resources authority lists of such objects and other information prescribed by that authority. Any such object which is not listed within the prescribed period shall be deemed to have been recovered after the date on which this Act came into effect. (b) Paragraph (a) does not apply to any public museum or university. (c) The responsible authority may at its discretion, by notice in the *Gazette* or the *Provincial Gazette*, as the case may be, exempt any institution from the requirements of paragraph (a) subject to such conditions as may be specified in the notice, and may by similar notice withdraw or amend such exemption.
- (8) An object or collection listed under subsection (7) — (a) Remains in the ownership of the possessor for the duration of his or her lifetime, and SAHRA must be notified who the successor is; and (b) must be regularly monitored in accordance with regulations by the responsible heritage authority.

## **HERITAGE RESOURCES MANAGEMENT**

**38.** (1) Subject on the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length; (b) the construction of a bridge or similar structure exceeding 50 m in length; (c) any development or other activity which will change the character of a site—(i) exceeding 5 000 m<sup>2</sup> in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of

which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; (d) the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent; (e) or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

### **3 OBJECTIVE**

The **objective of a Palaeontological Impact Assessment is to determine the impact of the development on potential palaeontological material** at the site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are: 1) to identify the palaeontological importance of the exposed and subsurface rock formations in the development footprint; 2) to evaluate the palaeontological importance of the formations; 3) to determine the impact of the development on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is compiled, the potentially fossiliferous rocks (i.e. groups, formations, etc.) present within the study area are established from 1:250 000 geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock section is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions (identifying fossils found in locations specifically in areas close to the development area). The palaeontological importance of each rock unit of the development area is then calculated. The possible impact of the proposed development footprint on local fossil heritage is established on the following criteria: 1) the palaeontological importance of the rocks; 2) the type and scale of the development footprint; and 3) quantity of bedrock excavated.

In the event that rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is required. Based on both the desktop data and field examination of the sedimentary rock exposures, the impact significance of the planned development is measured with recommendations for any further studies or mitigation. In general destructive impacts on palaeontological heritage only occur during construction. The excavations will transform the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation comprises the sampling, collection and recording of fossils and may precede construction or, more ideally, occur during construction when potentially fossiliferous bedrock is exposed. Preceding the excavation of any fossil heritage a permit from SAHRA must be obtained and the material will have to be housed in a permitted

institution. When mitigation is applied correctly, a positive impact is possible because our knowledge of local palaeontological heritage may be increased.

#### 4 GEOLOGICAL AND PALAEOLOGICAL HISTORY

The proposed footprint is underlain by sediments of the

- Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation;
- and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement (Fig.5).

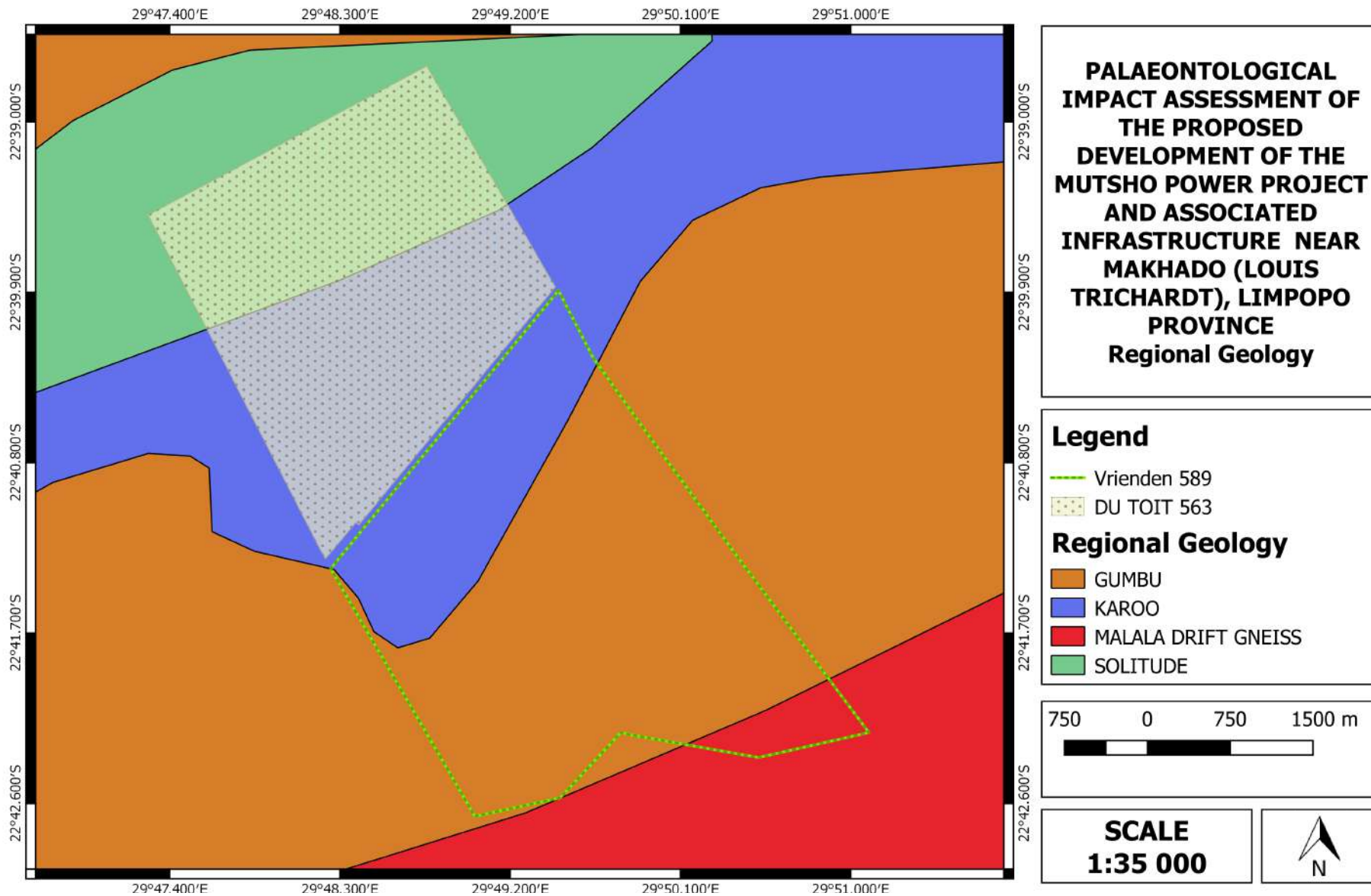
Fossil heritage could be present in the Undifferentiated Karoo as well as the Solitude Formation which has a high to very high Palaeontological Sensitivity. The Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group is metamorphic rocks which is unfossiliferous and with a very low palaeontological sensitivity.

The farm Du Toit 563 is entirely underlain by the Undifferentiated Karoo and the Solitude Formation. The north eastern part of the farm Vrienden 589 falls in the potentially fossiliferous Undifferentiated Karoo and the unfossiliferous Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group (Fig.5).

| <b>Palaeontological Sensitivity</b>                           | <b>Group</b>           | <b>Group/ Formation</b> | <b>Lithology</b>  | <b>Period</b>                      | <b>Fossils /Exposures</b>   |
|---|------------------------|-------------------------|---|------------------------------------|---|
| Almond et al (2008) and Groenewald et al., (2014)             |                        |                         |   |                                    |   |
| High to very high Palaeontological sensitivity/ vulnerability | Undifferentiated Karoo |                         | Sandstone conglomerate shale, mudstone and <b>coal deposits</b> | Permian -Triassic                  | Very poor levels of surface exposure (most data obtained from borehole cores) |
| High to very high Palaeontological sensitivity/ vulnerability | Karoo                  | Solitude                | Reddish and grey mudrocks, sandstones and minor                 | Upper part possibly = Elliot Lower | Upper part possibly = Elliot Lower part probably =                            |



| <b>Palaeontological Sensitivity</b>                      | <b>Group</b>                     | <b>Group/ Formation</b>                | <b>Lithology</b>  | <b>Period</b>   | <b>Fossils /Exposures</b>   |
|--|----------------------------------|--|---|---|---|
| Almond et al (2008) and Groenewald et al., (2014)        |                                  |  |   |   |   |
|  |                                  |  | coals, meandering fluvial setting   | part probably = Molteno                                   | Molteno Coal floras including <i>Dicroidium</i> in basal Solitude succession. Dinosaur remains supposedly |
| Very Low Palaeontological sensitivity/vulnerability grey | Archaean Granite-Gneiss Basement | Malala Drift Suite Beit Bridge Complex | Leucogneiss with metaquartzite, hornblende granitoid gneiss, amphibolite, metapelite and calc-silicate rocks                                | Early to Late Archaean (3.6 – 2.4 Ga) (Swazian / Randian) | No fossils recorded   |
| Very Low Palaeontological sensitivity/vulnerability grey | Archaean Granite-Gneiss Basement | Beit Bridge Complex; Gumbu Group       | Calc-silicate rocks and marble, together with leucogneisses and subordinate pink hornblende granitoid gneiss, metaquartzite and amphibolite | Early to Late Archaean (3.6 – 2.4 Ga) (Swazian / Randian) | No fossils recorded   |



**Figure 5:** The surface geology of the proposed Mutsho Power Project and associated infrastructure located on the farm Du Toit 563 and Vrienden 589, near Makhado, Limpopo Province. The site is completely underlain by the Undifferentiated Karoo Basin and Solitude Formation, as well as the Malala drift Gneiss, and Gumbu Group, Beit Bridge. Map was drawn by QGIS Desktop 2.18.14.

## **5 GEOGRAPHICAL LOCATION OF THE SITE**

Mutsho Power (Pty) Ltd is proposing the development of a new coal-fired power plant and associated infrastructure on the farms Du Toit 563 and Vrienden 589, near Makhado, in the Limpopo Province. A minimum footprint of roughly 350ha is necessary for the planned power station and associated infrastructure. While the physical power generation components (Power Island) require only in the region of 30 ha, supporting areas for the establishment of coal and other raw material stockpiles, and an ash dump over life of plant, enlarge the development footprint.

## **6 METHODS**

As part of the Palaeontological Impact Assessment, a field-survey of the development footprint was conducted in January 2018 to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed footprint of the development. A physical field-survey was conducted on foot and by vehicle within the proposed development footprint. The results of the field-survey, the author's experience, aerial photos (using Google Earth, 2018), topographical and geological maps were used to assess the proposed development footprint. No consultations were undertaken for this Impact Assessment.

### **6.1 Assumptions and limitations**

The accurateness of Palaeontological Desktop Impact Assessments is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material.

South Africa in its entirety has not been studied palaeontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Thus, the accuracy of Palaeontological Impact Assessment is improved by a field-survey.

## 7 FIELD OBSERVATIONS

The following photographs were taken on a site visit to the sites proposed for the new Mutsho Power Project and associated infrastructure in January 2018.



**Figure 3.** Flat topography of the farm Du Toit 563. The Farm is completely underlain by the Undifferentiated Karoo as well as the Solitude Formation. During the field survey no fossiliferous outcrops were found.





**Figure 4.** Flat topography of the farm Du Toit 563. The Farm is completely underlain by the Undifferentiated Karoo as well as the Solitude Formation. During the field survey no fossiliferous outcrops were found.



**Figure 5.** Flat topography of the farm Vrienden 589. The Farm is underlain by a small portion of the Undifferentiated Karoo Basin, Solitude Formation in the north and the Malala drift Gneiss, and Gumbu Group, Beit Bridge towards the south. During the field survey no fossiliferous outcrops were found.

## 8 ASSESSMENT OF IMPACTS

An assessment of the impact significance of the proposed 600 MW new coal-fired power plant and associated infrastructure on the farm Du Toit 563 and Vrienden 589 near Makhado, in the Limpopo Province on local fossil heritage is presented here:

### 8.1 Nature of the impact

**Infrastructure associated with the** new coal-fired power plant **includes:**  
(Information supplied by the developer):

- Power island comprising of:
  - Circulating Fluidised Bed (CFB) boiler technology.
  - Electrostatic Precipitator (ESP) / Bag filtration systems and Flue / smoke stacks.
  - Direct or indirect air-cooling systems.
  - Balance of plant components (incl. steam turbine and generator etc.).
- Coal and Limestone / Lime Rail Spur and-or Road offloading Systems.
- Upgrading or establishment of a rail siding.
- Coal crusher.
- Strategic and Working Coal stockpiles.
- Limestone or Lime (hydrated or de-hydrated) storage and handling area.
- Ash dump (dry-ashing has been assumed for the plant in order to reduce the project's water requirements, which is in alignment with the recommendations of the National Development Plan (NDP) and Integrated Energy Plan (IEP)).
- Water infrastructure. This may include:
  - Raw water storage dams.
  - Water supply pipelines and booster stations.
  - Pollution control dam/s.
  - Water treatment plant (WTP).
  - Wastewater treatment plant (WWTP).
  - Storm water management systems.
- HV Yard and substation components with HV overhead transmission lines connecting to the Eskom infrastructure.
- Control room, office / administration, workshop, storage and logistics buildings.
- Upgrading of external roads and establishment of internal access roads.
- Security fencing and lighting.

The excavations and site clearance of vegetation will consist of significant excavations into the uppermost sediment cover as well as into the underlying bedrock. These

excavations will transform the present topography and may disrupt, destroy or permanently close-in fossils that are then unavailable for research.

## **8.2 Geographical extent of impact**

The impact on fossil materials and thus palaeontological heritage will be restricted to the construction phase when new excavations into fresh bedrock take place. The extent of the area of potential impact is thus limited to the project site and categorised as **local**.

## **8.3 Duration of impact**

The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be **permanent**.

## **8.4 Sensitive areas**

The site is underlain by the Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation; and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement (Fig.2). The Archaean Granite-Gneiss Basement is metamorphic in origin and thus unfossiliferous while the Undifferentiated Karoo Basin and Solitude Formation has a high to very high palaeontological Sensitivity. During a field survey (including all three alternative layouts) of the development footprint, no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint.

## **8.5 Potential significance of the impact**

If the project progresses without care to the chance of fossils being present at the proposed site with the resultant damage and destruction of any affected fossils will be **permanent and irreversible**. Thus, any fossils occurring within the study area are potentially scientifically and culturally significant and any negative impact on them would be of **high significance**.

## **8.6 Severity / benefit scale**

A potential **secondary advantage** of the construction of the project would be that the excavations may uncover fossils and would have remained unknown to science.

## **8.7 STATUS**

### **Probability of the impact occurring**

There is a possibility that fossil heritage will be recorded in the study area. Probable significant impacts on palaeontological heritage during the construction phase are **high**.

### **Intensity**

The intensity of the impact on fossil heritage is rated as **medium**.



## **9 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSIBLE LOSS**

### **9.1 Mitigation**

In the event that fossil material does exist within the area proposed for the development, any negative impact upon it could be mitigated by recording and sampling of well-preserved fossils by a professional palaeontologist. (Please see chance find procedure at the end of this report). This should precede vegetation clearance and occur *before* the ground is levelled for construction. A collecting permit from SAHRA is required before any fossil heritage may be excavated and the material must be housed in an accredited institution.

### **9.2 Degree to which the impact can be mitigated**

The site is underlain by the Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation; and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement. ). The Archaean Granite-Gneiss Basement is metamorphic in origin and thus unfossiliferous, while the Undifferentiated Karoo Basin and Solitude Formation has a high to very high palaeontological Sensitivity. Suggested mitigation of the unavoidable damage and destruction of fossil heritage within the proposed site would involve the recording, and sampling of well-preserved fossils within the development footprint by a professional palaeontologist. This should precede vegetation clearance and occur *before* the ground is levelled for construction. Due to the expected low occurrence of fossils on the site, the significance of the impact following the mitigation will remain low.

### **9.3 Degree of irreversible loss**

Impacts on fossil heritage are generally irreversible. Well-documented records and other palaeontological studies of any fossils uncovered during construction would signify a positive impact from a scientific view. The possibility of a negative impact on the palaeontological heritage of the area can be reduced by the implementation of suitable mitigation procedures. With proper mitigation the benefit scale for the project will lie within the beneficial category.

### **9.4 Degree to which the impact may cause irreplaceable loss of resources**

It is **possible** that extraordinary fossil material is present on the development area. By taking a cautionary approach, an insignificant loss of fossil resources is expected.

### **9.5 Cumulative impacts**

The cumulative effect of the development is low as there is no other similar developments in the area.

## **10 ASSESSMENT OF IMPACTS**

## 10.1 Assessment Methodology

Direct, indirect and cumulative impacts of the impacts identified above will be assessed according to the following standard methodology:

- The **nature** which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent** wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high).
- The **duration** wherein it will be indicated whether:
  - The lifetime of the impact will be of very short duration (0 - 1 years) – assigned a score of 1;
  - The lifetime of the impact will be of short duration (2 - 5 years) – assigned a score of 2;
  - Medium-term (5 - 15 years) – assigned a score of 3;
  - Long-term (> 15 years) – assigned a score of 4; or
  - Permanent – assigned a score of 5.
- The **magnitude** quantified on a scale from 0 - 10 where 0 is small and will have no effect on the environment, 2 is minor and will result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease) and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1 - 5 where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but of low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The **significance** which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- The **status**, which is described as positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

$$S = (E + D + M) \times P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
- 30 – 60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated); and
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

**Nature:** The excavations and clearing of vegetation during the construction phase will consist of digging into the superficial sediment cover as well as underlying deeper bedrock. These excavations will change the existing topography and may possibly disturb, destroy or permanently close-in fossils at or below the ground surface. These fossils will then be lost for research.

Impacts on Palaeontological Heritage are likely to happen only within the construction phase. No impacts are expected to occur during the operation phase.

|   | <b>Without mitigation</b> | <b>With mitigation</b>  |
|---|---------------------------|-------------------------|
| <b>Extent</b>                           | Local(1)                  | Local(1)                |
| <b>Duration</b>                         | Long term/permanent (5)   | Long term/permanent (5) |
| <b>Magnitude</b>                        | Minor (2)                 | Minor (1)               |
| <b>Probability</b>                      | Improbable (1)            | Improbable (1)          |
| <b>Significance</b>                     | <b>Low (8)</b>            | <b>Low (7)</b>          |
| <b>Status (positive or negative)</b>    | Negative                  | Neutral                 |
| <b>Reversibility</b>                    | Irreversible              | Irreversible            |
| <b>Irreplaceable loss of resources?</b> | No                        | No                      |
| <b>Can impacts be mitigated?</b>        | Yes                       | Yes                     |

**Mitigation: Not necessary**

The site is underlain by the Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation; and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement. The Archaean Granite-Gneiss Basement is metamorphic in origin and thus unfossiliferous while the Undifferentiated Karoo Basin and Solitude Formation has a high to very high palaeontological Sensitivity. The lack of appropriate exposure at the proposed development footprint (including all three alternative sites) indicates that the impact of the development is of low significance in palaeontological terms.

### **Chance find Procedure**

- When a chance find is made the person must instantly stop all work near the find.
- The site must be secured to protect it from any additional damage
- The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.
- The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.
- Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.
- These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site
- The reports and all other documents will be submitted to SAHRA by the palaeontologist.
- The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.
- Once the required approvals have been issued, the Mine/development may carry on with the development.
- The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.

### ***Residual Risk:***

Loss of palaeontological heritage if impacts are not avoided



## 12 ASSESSMENT OF CUMULATIVE IMPACTS

|   |  |   |
|---|--|---|
| <b>Nature:</b> Cumulative impacts on fossil remains preserved at or beneath the ground surface.   |  |   |
|   | <b>Cumulative Contribution of Proposed Project</b> | <b>Cumulative Impact without Proposed Project</b> |
| <b>Extent</b>   | Local (1)  | Low (1)   |
| <b>Duration</b>   | Permanent (5)                                      | Permanent (5)                                     |
| <b>Magnitude</b>  | Minor (2)  | Minor (2)   |
| <b>Probability</b>  | Improbable (2)                                     | Improbable (1)                                    |
| <b>Significance</b>   | <b>Low (16)</b>                                    | <b>Low (8)</b>                                    |
| <b>Status (positive/negative)</b>   | Positive   | Positive  |
| <b>Reversibility</b>  | Low  | Low   |
| <b>Loss of resources?</b>   | No   | No  |
| <b>Can impacts be mitigated?</b>  | Yes  | Unknown   |
| <b>Confidence in findings:</b><br>High.   |  |   |
| <b>Mitigation: Not necessary</b><br>The site is underlain by the Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation; and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement. The Archaean Granite-Gneiss Basement is metamorphic in origin and thus unfossiliferous while the Undifferentiated Karoo Basin and Solitude Formation has a high to very high palaeontological Sensitivity. The lack of appropriate exposure at the proposed development footprint (including all three alternative sites) indicates that the impact of the development is of low significance in palaeontological terms. |  |   |

## 13 RECOMMENDATIONS CONCERNING FOSSIL HERITAGE MANAGEMENT DURING THE CONSTRUCTION PHASE

OBJECTIVE: Prevent the loss of Palaeontological Heritage

|                            |   |
|----------------------------|---|
| <b>Project component/s</b> | <p>Damaging impacts on palaeontological heritage occur during the <b>construction</b> phase which will modify the existing topography. The proposed development of the 600 MW new coal-fired power plant and associated infrastructure on the farm Du Toit 563 and Vrienden 589 near Makhado, in the Limpopo Province include:</p> <ul style="list-style-type: none"> <li>• Power island comprising of: <ul style="list-style-type: none"> <li>○ Circulating Fluidised Bed (CFB) boiler technology.</li> <li>○ Electrostatic Precipitator (ESP) / Bag filtration</li> </ul> </li> </ul> |
|----------------------------|---|

|  |  |                    |  |
|--|--|--------------------|--|
|  | <p>systems and Flue / smoke stacks.</p> <ul style="list-style-type: none"> <li>○ Direct or indirect air-cooling systems.</li> <li>○ Balance of plant components (incl. steam turbine and generator etc.).</li> </ul> <ul style="list-style-type: none"> <li>• Coal and Limestone / Lime Rail Spur and-or Road offloading Systems.</li> <li>• Upgrading or establishment of a rail siding.</li> <li>• Coal crusher.</li> <li>• Strategic and Working Coal stockpiles.</li> <li>• Limestone or Lime (hydrated or de-hydrated) storage and handling area.</li> <li>• Ash dump (dry-ashing has been assumed for the plant in order to reduce the project's water requirements, which is in alignment with the recommendations of the National Development Plan (NDP) and Integrated Energy Plan (IEP)).</li> <li>• Water infrastructure. This may include: <ul style="list-style-type: none"> <li>○ Raw water storage dams.</li> <li>○ Water supply pipelines and booster stations.</li> <li>○ Pollution control dam/s.</li> <li>○ Water treatment plant (WTP).</li> <li>○ Wastewater treatment plant (WWTP).</li> <li>○ Storm water management systems.</li> </ul> </li> <li>• HV Yard and substation components with HV overhead transmission lines connecting to the Eskom infrastructure.</li> <li>• Control room, office / administration, workshop, storage and logistics buildings.</li> <li>• Upgrading of external roads and establishment of internal access roads.</li> <li>• Security fencing and lighting.</li> </ul> |                    |  |
| <b>Potential Impact</b>  | Destruct, destroy or permanently close-in fossils at or below the ground surface that are then no longer available for research  |                    |  |
| <b>Activity/risk source</b>  | <ul style="list-style-type: none"> <li>• Activities associated with the construction of the 600 MW new coal-fired power plant and associated infrastructure</li> </ul>   |                    |  |
| <b>Mitigation: Target/Objective</b>  | Protection of identified fossils uncovered during the construction phase.  |                    |  |
| <b>Mitigation: Action/control</b>  | <b>Responsibility</b>  | <b>Timeframe</b>   |  |
| The site is underlain by the Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation; and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite- | EO   | Construction phase |  |

Gneiss Basement. The Archaean Granite-Gneiss Basement is metamorphic in origin and thus unfossiliferous while the Undifferentiated Karoo Basin and Solitude Formation has a high to very high palaeontological Sensitivity. The lack of appropriate exposure at the proposed development footprint (including all three alternative sites) indicates that the impact of the development is of low significance in palaeontological terms

## 11 FINDINGS AND RECOMMENDATIONS

Mutsho Power (Pty) Ltd proposes the development of a new coal-fired power plant and associated infrastructure on the farm Du Toit 563 and Vrienden 589 near Makhado, in the Limpopo Province. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is key to detect the presence of fossil material within the proposed development and it is thus necessary to assess the impact of the construction and operation of the development site on the palaeontological resources.

The proposed footprint is underlain by sediments of the

- Undifferentiated Karoo Basin; Tshipise and Tuli Sedimentary Basin and Solitude Formation;
- and Malala drift Gneiss and Gumbu Group of the Beit Bridge Complex, Archaean Granite-Gneiss Basement.

Three layout alternatives for the Mutsho Power Project were identified. According to the geology of the development footprint, fossil heritage could be present in the Undifferentiated Karoo which has a very high Palaeontological Sensitivity as well as the Solitude Formation with a high Palaeontological Sensitivity. The Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group is metamorphic rocks which is unfossiliferous and has a very low palaeontological sensitivity. The farm Du Toit 563 is entirely underlain by the Undifferentiated Karoo and the Solitude Formation. The north eastern part of the farm Vrienden 589 falls in the potentially fossiliferous Undifferentiated Karoo and the unfossiliferous Archaean Granite-Gneiss Basement, Beit Bridge Complex and Malala Drift Suite, Gumbu Group. During a field survey (including all three alternative layouts) of the development footprint, **no**

**fossiliferous outcrops** were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. Irrespective of the uncommon occurrence of fossils a solitary fossil may be of scientific value as many fossil taxa are known from a single fossil. The recording of fossils will expand our knowledge of the Palaeontological Heritage of the development area.

The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Mutsho Power Project, associated infrastructure and all three preferred layout plans will be of a low significance in palaeontological terms. It is therefore considered that the construction and operation of the Mutsho Power Project, associated infrastructure as well as all three alternative layout plans (and with all three alternatives equal) is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction and operation of the facility may be authorised as the whole extent of the development footprint is not considered sensitive in terms of palaeontological resources.

In the event that fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carry out by a professional palaeontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an approved collection which comprises a museum or university collection, while all fieldwork and reports should meet the minimum standards for palaeontological impact studies proposed by SAHRA.



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### **13 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR**

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty three years. She has been conducting Palaeontological Impact Assessments since 2014.

### **14 DECLARATION OF INDEPENDENCE**

I Elize Butler, 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 my objectivity in this work.

### **15 PROTOCOL FOR FINDS**

#### **Chance find Procedure**

- When a chance find is made the person must instantly stop all work near the find.
- The site must be secured to protect it from any additional damage
- The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.
- The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.
- Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.
- These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site
- The reports and all other documents will be submitted to SAHRA by the palaeontologist.

- The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.
- Once the required approvals have been issued, the Mine/development may carry on with the development.
- The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.



CTS HERITAGE

**APPENDIX 4: Specialist CVs**





CTS HERITAGE

## CURRICULUM VITAE

Katie Smuts

Tel: 072 796 7754 (c); 021 013 0131 (w)  
E-mail address: katie.smuts@ctsheritage.com  
ID number: 7806200125089

### EDUCATION:

#### Tertiary

- 2012 M.Phil in Archaeology (University of Cape Town)  
Title: *An Archaeology of the Eighteenth and Nineteenth Century Cape Wine Economy from the Perspective of Solms Delta and Babylonstoren*
- 1999 B.A. Honours. with Distinction in Archaeology and Historical Studies of the Western Cape (University of Cape Town)  
Title: *Painting People: an analysis of the depiction of human figures in a sample of procession and group scenes from the rock art of the South Western Cape, South Africa.*
- 1998 B.A. Archaeology (University of Cape Town)  
B.A. Classics (University of Cape Town)

#### Secondary

1991-1999 Wynberg Girls High School Dux Pupil.

#### Continuing Professional Development

- 2016 Antiquities Trafficking and Art Crime (University of Glasgow, Online Course)
- 2010 Continued Professional Development Course in Architecture and Urban Conservation Part I: Theory and Development and Part II: Skills Development (University of Cape Town)

### EMPLOYMENT HISTORY:

- February 2017 – Present : CTS Heritage  
Position : Heritage Specialist  
Responsibilities :
  - Heritage consulting
  - Production of Heritage Screeners,
  - Drafting integrated HIAs, heritage reports and management plans
  - GIS mapping and interpretation of spatial data
  - Proposal writing
  - Project management.
- October 2013 - December 2016 : South African Heritage Resources Agency  
Cape Town, South Africa  
Position : Manager of the National Inventory

CTS Heritage

34 Harries Street, Plumstead, Cape Town, 7800  
Tel: (021) 0130131 Email: info@ctsheritage.com Web: www.ctsheritage.com



CTS HERITAGE

**Responsibilities**

:

- Management of the National Inventory and responsible for the maintenance of the South African Heritage Resources Information System (SAHRIS);
- Coordinated the National Audit Project, which assists museums, galleries and other repositories to digitise their collections for inclusion in the national inventory and hosting on SAHRIS.
- Responsible for all strategic and operational planning, risk planning and management, budgeting, project formulation and execution; appointment, management and performance review of staff; and reporting on Unit activities to Executive for audit purposes.
- Organised workshops, seminars and training sessions around the country to promote heritage and roll out SAHRIS
- Responsible for maintaining the SAHRIS Facebook page and Twitter account.

May 2012 - October 2013

:

SAHRA

Cape Town, South Africa

Position

:

Heritage Officer, Archaeology,

Palaeontology and Meteorites Unit

**Responsibilities**

:

- Assessing Heritage Impact Assessments submitted to SAHRA, in terms of Section 38 of the NHRA, for development and mining applications in the Northern Cape and North West Province.
- Stakeholder management with state departments, heritage authorities and heritage associations to further heritage management in South Africa.
- Initiated the declaration of the Kathu Complex of Archaeological Sites as National Heritage Sites.

March 2009 - May 2012

:

Self-employed

Cape Town, South Africa

Position

:

Principal Investigator

**Responsibilities**

:

- Site excavation and survey, as well as building fabric analysis on several historic Western Cape farmsteads.
- Submission of permit applications, permit reports and Archaeological Impact Assessments to Heritage Authorities in terms of Sections 35 and 38 of the NHRA.

August 2006 – October 2006

:

Butrint Foundation

Butrint, Albania

Position

:

Sector Manager

**Responsibilities**

:

- Management of excavations in a designated area of the GrecoRoman temple in the Butrint World Heritage Site, Albania.

February 2006 – February 2009

:

ACO Associates

Cape Town, South Africa

Position

:

Field Assistant/Director

**Responsibilities**

:

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## CTS HERITAGE

- Field Assistant or Field Director on a variety of projects, including archaeological survey, building analysis and excavation.
- Assisted with the writing, synthesis and editing of Heritage Impact Assessments, Archaeological Impact Assessments and field reports.

- October 2004 - January 2006 : Various Contract Firms  
United Kingdom  
Position : Field Assistant  
Responsibilities :
  - Survey and excavation of a variety of UK archaeological sites for various commercial archaeology units.
- June 2003 - March 2004 : ACO Associates  
Cape Town, South Africa  
Position : Field Assistant  
Responsibilities :
  - Assisting on rescue excavations of informal human burial site, Prestwich Place, Cape Town.
- January 2000 - December 2000 : Clanwilliam Living Landscape Project  
Clanwilliam, South Africa  
Position : Co-director  
Responsibilities :
  - Initiated and coordinated the CLLP programme with Professor John Parkington, which uses archaeological methodology and practical experiences to teach maths and science principles and application to rural school children.
  - Liaised with teachers and representatives of the Department of Education to create curricula and teaching materials.
  - Projects included collecting, recording and analysing archaeological material from the Clanwilliam Dam for a Heritage Day display, statistical analysis of gravestones, rock art recording and scientific investigation of cultural landscapes.
- January 1999 - May 2000 : University of Cape Town  
Cape Town, South Africa  
Position : Student Lecturer and tutor  
Responsibilities :
  - Tutored first and second year Archaeology students for Prof. Judith Sealy.
  - Devised and taught lectures, and set and marked exams for first year semester course on South African, French and Australian rock art for Prof. Parkington.

### AFFILIATIONS:

- 2017 - present: Executive Committee Member of Association of Southern African Professional Archaeologists (ASAPA) and Co-Chair of the Cultural Resource Management (CRM) Subcommittee
- 2017 - present: Member of the Stanford Heritage Committee (SHC)
- 2016 - present: Member of the Overstrand Heritage and Aesthetics Committee (OHAC)

#### CTS Heritage

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Tel: (021) 0130131 Email: [info@ctsheritage.com](mailto:info@ctsheritage.com) Web: [www.ctsheritage.com](http://www.ctsheritage.com)



CTS HERITAGE

- 2015 - present: Member of Association of Professional Heritage (APHP);  
2015 - 2016: Executive Committee Member of APHP and Chairperson of APHP Accreditation Committee
- 2015 - present: Treasurer of the Heritage Association of Southern Africa (HASA)  
2013 - present: Member of the South African Museums Association (SAMA)  
2012 - present: Member of the Vernacular Architecture Society of South Africa (VASSA)  
2008 - present: CRM accredited member of ASAPA: accreditation in Rock Art, Coastal Shell Middens, Stone Age Archaeology and Grave Relocation

### SELECTED PUBLICATIONS:

- Smuts, K., Mlungwana, N And Wiltshire, N. In press. Sahris: South Africa's web-based, integrated Heritage Management System. *Journal of Cultural Heritage Management And Sustainable Development*, 2016. United Kingdom: Emerald Group Publishing.
- Smuts, K. In press. SAHRIS: using the South African Heritage Register to report, track and monitor heritage crime. *ISPRS Annals of the Annual CIPA Congress*. 2015. Taipei: International Archives of the Photogrammetry, Remote Sensing and Spatial Information
- Smuts, K. In press. SAHRIS as a Tool for Reporting, Tracking and Managing Cases of Heritage Crime in South Africa. *South African Museums Association Bulletin*. 2015. Johannesburg: South African Museums Association.
- Smuts, K. and Wiltshire, N. 2016. Heritage Management and the World Wide Web: South African Challenges. In Sadr, K., Esterhuysen, A. and Sievers, C. (eds). *African Archaeology without Frontiers: Papers from the 2014 PanAfrican Archaeological Association Congress*. Johannesburg: Wits University Press, pp. 165-177.
- Smuts, K. 2012: An Archaeology of the Eighteenth and Nineteenth Century Cape Wine Economy from the Perspective of Solms Delta and Babylonstoren. UCT: unpublished MPhil dissertation.
- Smuts, K. 2008: A Troy in Miniature: excavations at Butrint, Albania. *The Digging Stick* 25(2): 59. Johannesburg: Wits University Press.
- Smuts, K. 1999: Painting People: an analysis of the depiction of human figures in a sample of procession and group scenes from the rock art of the South Western Cape, South Africa. UCT: unpublished BA Honours thesis.

### REFERENCES

1. Executive Officer, SAHRA  
Mr Dumisani Sibayi  
Tel: 021 462 4502  
Email: dsibayi@sahra.org.za
2. Deputy Director, Heritage Western Cape  
Mrs Colette Scheermeyer  
Tel: 021 483 9682

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CTS HERITAGE

Email: [colette.scheermeyer@westerncape.gov.za](mailto:colette.scheermeyer@westerncape.gov.za)

3. Director of ACO Associates

Mr Tim Hart

Tel: 021 706 4104

Email: [tim.hart@acoassociates.com](mailto:tim.hart@acoassociates.com)

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## CURRICULUM VITAE



**Jenna Lavin**

Tel: 083 619 0854 (c); 013 0131 (w)  
E-mail address: jenna.lavin@cedartower.co.za  
ID number: 8512050014089

### **EDUCATION:**

#### **Tertiary**

- 2014 - M.Phil in Conservation of the Built Environment (University of Cape Town)  
Ongoing - expected to graduate in 2015
- 2011 Continued Professional Development Course in Urban Conservation Management (University of Cape Town) Part I and Part II
- 2010 M.Sc. with Distinction in Archaeology (University of Cape Town)  
Title: *Palaeoecology of the KBS member of the Koobi Fora Formation: Implications for Pleistocene Hominin Behaviour.*
- 2007 B.Sc. Honours in Archaeology (University of Cape Town)  
Title: *The Lost Tribes of the Peninsula: An Investigation into the historical distribution of Chacma baboons (*Papio ursinus*) at the Cape Peninsula, South Africa.*  
Koobi Fora Field School, Rutgers University (U.S.A.)/ National Museums of Kenya
- 2006 B.Sc. Archaeology (University of Cape Town)  
B.Sc. Environmental and Geographic Science (University of Cape Town)

#### **Secondary**

- 1999-2003 Rustenburg High School for Girls  
Firsts in English, Afrikaans, Mathematics HG, Biology HG, History HG, Entrepreneurship.



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## **EMPLOYMENT HISTORY:**

### **PROFESSIONAL DEVELOPMENT**

#### **Environmental and Heritage Management:**

- Head of Heritage Operations for Heritage CTS Consultants and member of OpenHeritage NPC.  
*July 2016 to present*
- Assistant Director for Policy, Research and Planning at Heritage Western Cape.  
*August 2014 to June 2016*

Responsibilities include drafting of new heritage related policy, the grading and declaration of Provincial Heritage Sites, the development of Conservation Management Plans, facilitating the development of inventories of heritage resources through local authorities as well as managing the development of the Western Cape's Heritage Information Management System (HIMS).

Acting Deputy Director from April to December 2015.

- Heritage Officer for Palaeontology and for the Mpumalanga Province at the South African Heritage Resources Agency (SAHRA).  
*January 2013 to June 2014*

Responsibilities include dealing with palaeontological permit applications in terms of Section 35 of the NHRA and development applications in terms of Section 38 of the NHRA. Projects included the development of a National Palaeotechnic Report identifying significant palaeontological deposits throughout SA, as well as developing professional relationships between SAHRA and the Palaeontological Society of South Africa (PSSA) and the Geological Society of South Africa (GSSA). During this time, I was part of the team that developed the digitised National Palaeontological Sensitivity Map (<http://www.sahra.org.za/about/news/nov2013/palaeosensitivitymap>), the first of its kind in the world.

- Heritage Officer for Archaeology, Palaeontology and Meteorites at Heritage Western Cape (HWC).  
*September 2010 to December 2012*

HWC is a Public Entity that forms part of the Heritage Resource Management Component of the Provincial Governments' Department of Cultural Affairs and Sport (DCAS). Projects included the declaration of Pinnacle Point and the West Coast Fossil Park as Provincial Heritage Sites (PHS), the management of the development of the Baboon Point PHS Conservation Management Plan as well as an educational outreach program as part of the DCAS MOD Centre Project.



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- Heritage Officer for the Archaeology, Palaeontology and Meteorites Unit of the South African Heritage Resources Agency (SAHRA) as part of a three month contract.  
*January 2010 to March 2010*
- Environmental Control Officer, Amathemba Environmental Management Consulting  
*Part time: 2007 to 2009*

### **Other**

My private experience as a traveler in South Africa, Tanzania, Kenya, Namibia, Zambia, Malawi and Mozambique has inspired a passion for the conservation of environmental and heritage resources. I am passionate about sustainable living, with my Bachelor of Science in Environmental and Geographical Science providing a framework on which to base my values.

With a friend, I established the fundraising initiative, Chicks4Change, through which we managed to organize a number of successful events and raise R40 000 for Project Rhino to assist with anti-poaching initiatives.

In 2013 I was asked to join the panel of judges for the Ministerial awards for Heritage in the Western Cape. From 2013 to July 2014, I was a member of the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee. In July 2014, I presented at the Conference for the Palaeontological Society of South Africa on the use of GIS in the management of palaeontological resources in the face of increased development pressures. In April 2015 I participated in a conference on Landscape Archaeology hosted by the Leakey Foundation in San Fransisco, presenting on the management of archaeological landscapes in South Africa. In April 2016, I presented at the ICAHM Conference in Salalah, Oman on the management of archaeological heritage in South Africa.

In November 2013, I was awarded a bursary from the Department of Arts and Culture to complete the Masters in Philosophy in Conservation of the Built Environment through the UCT Faculty of Engineering and the Built Environment in 2014 and 2015.

I am a paid up member of the Association for Southern African Professional Archaeologists (ASAPA), the Association of Professional Heritage Practitioners (APHP), the Palaeontological Society of South Africa (PSSA) and ICOMOS South Africa, for which I am Vice-President of the Board. I am also a member of the International Committee for Archaeological Heritage Management (ICAHM).



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## CURRICULUM VITAE



### KYLA BLUFF

Tel: 076 650 9814(c); 021 685 1824 (w)  
E-mail address: [kyla.bluff@openheritage.org.za](mailto:kyla.bluff@openheritage.org.za)

#### **EDUCATION:**

- **B.Soc.Sc. (Honours), Archeology** - University of Cape Town (2010)
- **B.Soc.Sc., Archeology, Religious Studies** - University of Cape Town (2008)

**Current Studies:** M.Sc., Archeology - University of Cape Town (2013-present)

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#### **EMPLOYMENT HISTORY:**

**June 2014 – present** : **Cedar Tower Services**  
**Position** : **Cape Town, South Africa**  
**Responsibilities** : **Associate**

- Sales and Communication
- Compilation of Heritage Screeners
- Heritage Consulting and Research
- Software Training and Support
- Systems Administration
- Data Capturing and Documentation of Archaeological sites and Artefacts
- General Business Development
- Oversight and Management of Interns at CTS



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**April 2015 - present** : **OpenHeritage**  
**Cape Town, South Africa**  
**Position** : **Director**  
**Responsibilities** :

- Fundraising
- Digitisation and moderation of heritage records
- Training in newly developed systems
- Communications

**February 2013 - May 2014** : **The Bluffs Property Consultants**  
**Position** : **Administrator**  
**Responsibilities** :

- Marketing
- Rental Administration
- Show-house sitting

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### **SPECIFIC ARCHEOLOGICAL EXPERIENCE:**

#### **Archaeological Surveys:**

- 2014-present: Numerous surveys with eCRAG (eastern Cederberg Rock Art Group) to locate, record and digitise rock art and artefact sites
- 2010-2011: Numerous surveys of paleontological, archaeological and historical sites with the ACO, including: identification of survey zones on the landscape; identification of specific archaeological sites; recording of sites and artefacts

#### **Excavations:**

- Mar and Oct 2014: Mertenhof, seasons 3 and 4, Alex Mackay
- Feb and Oct 2013: Mertenhof, seasons 1 and 2, Alex Mackay
- Aug and Oct 2012: Klipfonteinrand, season 4/5, Alex Mackay
- May 2012: Klipfonteinrand, season 3, Alex Mackay
- April 2012: Bree Street historical excavation, Katie Smuts
- June 2011: Bethlehem Farm excavation, Hugo Pinto
- Oct 2011: Klipfonteinrand, season 2, Alex Mackay
- May 2011: Solms Delta Wine Estate historical excavation, Hugo Pinto
- April 2011: De Meule historical excavation, ACO
- Mar-Apr 2011: Klipfonteinrand, season 1, Alex Mackay
- Jan 2011: Putslaagte, Alex Mackay





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- Nov 2010 and May 2011: Pinnacle Point (volunteer), Curtis Marean
- Mar-May 2010: MCRM project, Charles Arthur
- Jan 2009: Elandsfontein Archaeology Field School, David Braun
- Jan 2009: UCT Middle Campus tennis court historical excavation, ACO
- June 2008: Hollow Rock Shelter, Lars Larsson

### **Post-Excavation Analysis:**

- Sorting and analysis of finds
  - Recording and interpretation of sediments and excavation
  - Data-basing records and information, including artefacts and residues
- 

### **OTHER EXPERIENCE:**

- **January 2009 - 2011:** Field Assistant & Intern; UCT Archaeology Contracts Office
  - **2013-2014:** Excavation, general site management, data capture & analysis of artefacts and residues; Mertenhof Rock Shelter, Alex Mackay
  - **2011-2012:** Excavation, general site management, data capture & analysis of artefacts and residues; Klipfonteinrand Rock Shelter, Alex Mackay
  - **Apr 2012:** 22 Bree Street: pre-development excavations of 19th century site, Katie Smuts
  - **Jan 2012:** SAHRA Maritime and Underwater Cultural Heritage Field School
  - **Jun 2011:** Structural analysis & excavation: Bethlehem Farm, Pniel, Hugo Pinto
  - **May 2011:** Historical excavations of 17th century foundations: Solms Delta Wine Estate, Hugo Pinto
  - **Apr 2011:** Pre-renovation excavations: The Old Miller's House, De Meule, Tim Hart, Archaeology Contracts Office
  - **2010-2011:** Research supervisor & educator of heritage management & archaeology for the Clanwilliam Living Landscape Project (CLLP); John Parkington and National Heritage Council
  - **Aug 2010-Feb 2011:** Photographer, producer and seller of photos, Happy Snappy Photo Company - Table Mountain
  - **Mar-May 2010:** Archaeological Assistant, Excavator and Finds Manager; Metolong Cultural Resource Management (MCRM) Project; Prof. Peter Mitchell and Charles Arthur, Lesotho
  - **Feb 2010:** Qualified SA Host tour guide
  - **2009-2010:** Founding member and events coordinator of the Archaeological & Geographical Expeditionary Society (UCT)
  - **Jan 2009:** Historical excavation: UCT Middle Campus tennis court, Tim Hart, Archaeology Contracts Office
  - **2007-2009:** Photography Teacher, Wynberg Girls' High School
-



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**REFERENCES:**

**Nic Wiltshire**

Director, Cedar Tower Services  
+27 (21) 685 1824  
nic.wiltshire@cedartower.co.za

**Alex Mackay**

Senior Field Archaeologist - Putslaagte, Klipfonteinrand and Mertenhof excavations  
mackay.ac@gmail.com

**John Parkington**

Professor Emeritus - UCT, Employer of CLLP project  
+27 79 872 4807  
john.parkington@uct.ac.za

**Katie Smuts**

Heritage Officer: Archaeology, Paleontology and Meteorites Unit - SAHRA  
+27 72 7967754  
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**Cheryl Bluff**

Owner & Sales Associate - The Bluff's Property Consultants  
+27 (21) 762 5628  
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**Curtis Marean**

Senior Field Archaeologist - Pinnacle Point excavations  
+27 76 890 6153  
curtis.marean@asu.edu

**Tim Hart**

Principal Investigator - UCT Archaeology Contracts Office  
+27 21 650 2353  
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**Personal Details**

**Residential Address**

Dr. Foreman Bandama  
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 Cape Town, South Africa

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 Upper Campus, Beattie Building  
 University of Cape Town  
 Private Bag 7701 Rondebosch  
 Cape Town, South Africa

|                         |   |                       |          |                             |                                |
|-------------------------|---|-----------------------|----------|-----------------------------|--------------------------------|
| <b>Title</b>            | Dr  | <b>Surname</b>        | Bandama  | <b>First name</b>           | Foreman                        |
| <b>Citizenship</b>      | Zimbabwean  | <b>Passport #</b>     | BN718525 | <b>Date of Birth</b>        | 08-04-1984                     |
| <b>Gender</b>           | Male  | <b>Marital Status</b> | Married  | <b>Religion</b>             | Christianity                   |
| <b>Contacts</b>         | <b>Email:</b> <a href="mailto:fbandama@yahoo.co.uk">fbandama@yahoo.co.uk</a><br><b>Alternative email:</b> <a href="mailto:fbandama@gmail.com">fbandama@gmail.com</a>                  |                       |          | <b>Tel:</b> +27 11 029 2555 | <b>Mobile:</b> +27 82 404 6592 |
| <b>Driver's License</b> | Code B, South Africa  |                       |          |                             |                                |
| <b>Qualifications</b>   | Ph.D. (Archaeology) (2013) [University of Cape Town]<br>B.A. Honours (Archaeology) (2008) & B.A. General (Archaeology, Economic History & Geography) (2007) [University of Zimbabwe]. |                       |          |                             |                                |

**Languages (Scale of 1-5: 1= excellent, 5 = poor)**

| Language                                 | Speaking  | Reading   | Writing   |
|--|-----------|-----------|-----------|
| English                                  | Excellent | Excellent | Excellent |
| xiTsonga                                 | Excellent | Excellent | Excellent |
| Shona                                    | Excellent | Excellent | Excellent |
| isiXhosa/Zulu/Ndebele/Sotho/Tswana/Venda | Fair      | Fair      | Fair      |

**Computer literacy**

|          |            |
|----------|------------|
| ACTIVITY | PROGRAMMES |
|----------|------------|

|                             |   |
|-----------------------------|---|
| Processing & Presentation   | <b>Microsoft Word, Excel, PowerPoint &amp; Access</b> |
| Image design & Manipulation | <b>Adobe Photoshop &amp; Illustrator</b>              |
| Mapping                     | <b>Quantum GIS, TakGIS and basic ArcView GIS</b>      |
| Statistics                  | <b>Statistica, Stata &amp; Sigma Plot</b>             |

### Professional training

|   |                               |
|---|-------------------------------|
| <b>Archaeological contract skills:</b>            | Siyathembana 293 Pty          |
| <b>Scanning Electron Microscopy:</b>              | University of Cape Town (UCT) |
| <b>Optical Microscopy:</b>                        | University of Cape Town       |
| <b>X-Ray Fluorescence Spectroscopy:</b>           | University of Cape Town       |
| <b>Archaeological fieldwork &amp; interviews:</b> | University of Zimbabwe & UCT  |
| <b>Ethnography &amp; oral history:</b>            | University of Cape Town       |
| <b>Teaching skills:</b>                           | University of Zimbabwe & UCT  |
| <b>Curatorial skills:</b>                         | University of Zimbabwe        |

### Cultural Resource Management (CRM) experience

**2016** Revised Phase 1 Heritage Impact Assessment for Afrimat Aggregates Trading (Pty) Ltd's proposed for Sand Mining on Remainder of Portion 8, Modder River Farm 499, Worcester, Western Cape.

- Desktop research (100% responsibility)
- Fieldwork (100% responsibility)
- Mapping (100% responsibility)
- Report write-up (100% responsibility)

**2015a** A Phase 1 Heritage Impact Assessment for Afrimat Aggregates Trading (Pty) Ltd's proposed for Mining Right and Water Use License application for the existing GaMohaam Quarry, near Kuruman, Northern Cape.

- Desktop research (100% responsibility)

- Fieldwork (100% responsibility)
- Mapping (100% responsibility)
- Report write-up (100% responsibility)

**2015b** A Phase 1 Heritage Impact Assessment for the Transnet Engineering's proposed Koedoespoort Landfill Site in Silverton, Pretoria East.

- Desktop research (100% responsibility)
- Fieldwork (100% responsibility)
- Mapping (100% responsibility)
- Report write-up (100% responsibility)

**2015c** Mitigation of archaeological sites to be impacted by the consolidation of existing activities at Venetia Diamond Mine, near Alldays, Musina, Limpopo Province (South Africa).

- Desktop research (100% responsibility)
- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

**2014** Archaeological Impact Assessment of the proposed Krone-Endora Diamond Mine (Mining Rights Applications 11011MR & 10017MR) on portions of farms Krone 104MS and Endora 66MS near Alldays, Musina, Limpopo Province (South Africa).

- Desktop research (100% responsibility)
- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

**2014** The Integrated Management Plan for the Royal Bafokeng Archaeological Heritage Sites (South Africa)

- Desktop research (100% responsibility)



- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

**2013** A survey of archaeological resources in the Royal Bafokeng Nation Land (South Africa).

- Desktop research (100% responsibility)
- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

**2012-2013a** A Phase 1 Archaeological Impact Assessment for the Gamma (Victoria West, Northern Cape) - Kappa (Ceres – Western Cape) 765Kv (2) Eskom power transmission line (South Africa).

- Desktop research (100% responsibility)
- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

**2012-2013b** A Phase 1 Archaeological Impact Assessment for the proposed Kappa – Omega 765Kv Eskom power transmission line (South Africa).

- Desktop research (100% responsibility)
- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

**2011** Kaditshwene Integrated Management Plan for SAHRA (South Africa).

- Desktop research (100% responsibility)
- Fieldwork (50% responsibility)
- Mapping (100% responsibility)
- Report write-up (50% responsibility)

## Teaching experience

**CO-LECTURER:** Department of Archaeology, University of Cape Town.

| CANDIDATE INFO  | COURSE/MODULE & RESPONSIBILITIES   |
|---|--|
| <b>7 years in this course.</b><br><b>(Qualifications:</b><br><b>Ph.D. Archaeology</b><br><b>since 2013, BA</b><br><b>Honours</b><br><b>Archaeology since</b><br><b>2008).</b> | The roots of black identity in South Africa (AGE3011F) (3 <sup>rd</sup> year Archaeology) <ul style="list-style-type: none"> <li>➤ <b>16 class lectures in 2016</b></li> <li>➤ <b>12 class lectures in 2015</b></li> <li>➤ <b>14 class lectures in 2013</b></li> <li>➤ <b>12 class lectures in 2012</b></li> <li>➤ <b>12 class lectures in 2011</b></li> <li>➤ <b>4 class lectures in 2010</b></li> <li>➤ Preparing course outline and reading list</li> <li>➤ Developing content for lectures and practicals</li> </ul> |

**LECTURER & COURSE CONVENER:** Department of Archaeology, University of Cape Town.

| CANDIDATE INFO  | COURSE/MODULE & RESPONSIBILITIES  |
|---|---|
| <b>4 years in this course.</b><br><b>(Qualifications:</b><br><b>Ph.D. Archaeology</b><br><b>since 2013, B.A.</b><br><b>Honours</b><br><b>Archaeology since</b><br><b>2008).</b> | The roots of black identity in South Africa (AGE3011F) (3 <sup>rd</sup> year Archaeology) <ul style="list-style-type: none"> <li>➤ <b>52 class lectures in 2014</b></li> <li>➤ Preparing course outline and reading list</li> <li>➤ Developing content for lectures and practicals</li> <li>➤ Developing and marking the class assignments, tests and the final examinations</li> </ul> |

**TEACHING ASSISTANT:** Department of Archaeology, University of Cape Town.

| CANDIDATE INFO   | COURSE/MODULE & RESPONSIBILITIES  |
|--|---|
| <b>4 years in this course.</b><br><b>(Qualifications:</b><br><b>Ph.D. Candidate,</b><br><b>B.A. Honours</b><br><b>Archaeology since</b><br><b>2008).</b> | The roots of black identity in South Africa (AGE3011F) (3 <sup>rd</sup> year Archaeology) <ul style="list-style-type: none"> <li>➤ <b>15 practical sessions in 2013</b></li> <li>➤ <b>15 practical sessions in 2012</b></li> <li>➤ <b>10 practical sessions in 2011</b></li> <li>➤ <b>10 practical sessions in 2010</b></li> <li>➤ Developing content for practicals</li> </ul> |

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li>➤ Developing and marking the practical assignments and tests.</li> </ul>   |
| <b>2 years in this course.</b><br><b>(Qualifications:</b><br><b>Ph.D. Candidate,</b><br><b>B.A. Honours</b><br><b>Archaeology since</b><br><b>2008).</b> | Africa and World Archaeology (AGE1002S) (1 <sup>st</sup> year Archaeology) <ul style="list-style-type: none"> <li>➤ <b>10 Practical sessions in 2010</b></li> <li>➤ <b>10 Practical sessions in 2009</b></li> <li>➤ Developing content for practicals</li> <li>➤ Developing and marking the practical assignments and tests.</li> </ul> |
| <b>1 year in this course.</b><br><b>(Qualifications:</b><br><b>Ph.D. Candidate,</b><br><b>B.A. Honours</b><br><b>Archaeology since</b><br><b>2008).</b>  | Heritage Management Module for BSc Honours in Archaeology (AGE400W) <ul style="list-style-type: none"> <li>➤ <b>5 class practical sessions and 1 fieldwork session in 2009</b></li> <li>➤ Developing content for practicals</li> <li>➤ Developing and marking the practical assignments and tests.</li> </ul>                           |

**TEACHING ASSISTANT:** Department of Geological Sciences, University of Cape Town.

| CANDIDATE INFO  | COURSE/MODULE & RESPONSIBILITIES   |
|---|--|
| <b>3 years in this course.</b><br><b>(Qualifications:</b><br><b>Ph.D. Archaeology</b><br><b>since 2013, B.A.</b><br><b>Honours</b><br><b>Archaeology since</b><br><b>2008).</b> | Introduction to earth and environmental sciences (GEO1009F) (1 <sup>st</sup> year Geology) <ul style="list-style-type: none"> <li>➤ <b>6 class practical and 2 fieldwork sessions in 2014</b></li> <li>➤ <b>6 class practical and 2 fieldwork sessions in 2013</b></li> <li>➤ <b>6 class practical and 2 fieldwork sessions in 2012</b></li> <li>➤ Developing content for practicals</li> <li>➤ Developing and marking the practical assignments and tests.</li> </ul> |

**TEACHING ASSISTANT:** Department of History, University of Zimbabwe.

| CANDIDATE INFO  | COURSE/MODULE & RESPONSIBILITIES  |
|---|---|
| <b>1 years in this course.</b><br><b>(Qualifications: B.A.</b><br><b>Honours</b><br><b>Archaeology since</b><br><b>2008, B.A. General).</b> | Introduction to Archaeological Theory II (ARC2030) (2 <sup>nd</sup> year Archaeology) <ul style="list-style-type: none"> <li>➤ <b>10 class practical sessions in 2009</b></li> <li>➤ <b>5 class practical sessions in 2008</b></li> <li>➤ Developing content for practicals</li> <li>➤ Developing and marking the practical assignments and tests.</li> </ul> |

## INVITED LECTURESHIPS

| CANDIDATE INFO   | COURSE/MODULE & INSTITUTION  |
|--|--|
| <b>(Qualifications:</b><br><b>Ph.D. Candidate,</b><br><b>B.A. Honours</b><br><b>Archaeology since</b><br><b>2008).</b> | BA in Education, School of Mathematics and Science, University of Western Cape (3 <sup>rd</sup> year Education). <b>(1 double lecture in 2013).</b>                  |
|  | Stratigraphy and Economic Geology (GEO2001S) (3 <sup>rd</sup> year Geology), Department of Geological Sciences, University of Cape Town. <b>(2 lectures in 2012)</b> |

### Other administrative/work experiences

**INFORMATION MANAGER:** Siyathembana Trading 293 Pty  
(01/05/2009-31/09/2015)

| CANDIDATE INFO   | RESPONSIBILITIES & OUTPUT   |
|--|---|
| <b>6 years in this position.</b><br><b>(Qualifications: Ph.D. Archaeology</b><br><b>(2013), B.A. Honours Archaeology</b><br><b>(2008) and B.A. General (2007).</b> | Responsible for fieldwork, mapping, graphic designing, research and report write-ups of archaeological and heritage impact assessment services. |

**HERITAGE MANAGER:** Siyathembana Trading 293 Pty (01/10/2015-Present)

| CANDIDATE INFO  | RESPONSIBILITIES & OUTPUT   |
|---|---|
| <b>6 years in this position.</b><br><b>Qualifications: Ph.D. Archaeology</b><br><b>(2013), B.A. Honours Archaeology</b><br><b>(2008) and B.A. General (2007).</b> | Responsible for research, heritage and archeology impact assessments, inventorying, curation, management, restoration and rehabilitation of heritage resources. |

**NRF POST-DOCTORAL RESEARCH FELLOW:** University of Cape Town

| CANDIDATE INFO   | RESPONSIBILITIES & OUTPUT  |
|--|--|
| <b>3 years in this</b><br><b>position.</b><br><b>(Qualifications:</b><br><b>Ph.D. Archaeology</b><br><b>since 2013, B.A.</b><br><b>Honours</b> | <ul style="list-style-type: none"> <li>➤ <b>Produced 7 research articles in high impact journals (2014-2016).</b></li> <li>➤ Developed content for grant applications for my principal investigator.</li> <li>➤ Carried out field work (excavations and surveys) at two World Heritage Sites (Great Zimbabwe and Khami) and several other</li> </ul> |

|   |   |
|---|---|
| Archaeology since 2008, B.A. General since 2007). | <p>sites related to social complexity in Zimbabwe and South Africa.</p> <ul style="list-style-type: none"> <li>➤ Mapped the site of Mapela and re-mapped the World Heritage Sites of Great Zimbabwe and Khami.</li> <li>➤ Mentored 5 BSc. Honours and 2 MSc. Archaeology students who have already graduated.</li> <li>➤ Currently mentoring (2 PhD. and 1 MSc.) and co-supervising (1 MSc.) Archaeology students.</li> </ul> |
|---|---|

**SEMINAR CONVENER:** Department of Archaeology, University of Cape Town

| CANDIDATE INFO  | RESPONSIBILITIES & OUTPUT   |
|---|---|
| <p>1 year in this position.<br/>(Qualifications: Ph.D. Archaeology since 2013, B.A. Honours Archaeology since 2008, B.A. General since 2007).</p> | <ul style="list-style-type: none"> <li>➤ Organised Archaeology Departmental Seminars in 2015</li> <li>➤ Chaired and moderated sessions.</li> <li>➤ Scouted and invited speakers from all over the world, leading to the successful hosting of 2 colleagues from the University of California Davies (USA), 1 from the University of Toronto (Canada), 1 from the University of Oslo (Norway), 1 from Dar es Salaam (Tanzania) and 1 from Kyambogo University (Uganda). I also gave PhD (3) and MSc (4) students the opportunity to deliver seminars, along with a several other colleagues from the within South Africa.</li> <li>➤ Advertising seminars and inviting university audience.</li> </ul> |

**Publications 1: Journal papers**

Fredriksen, P.D. and **Bandama, F.** 2016. The mobility of memory: space/knowledge dynamics in rural potting workshops in Limpopo Province, South Africa. *Azania: Archaeological Research in Africa*. (Now available online) DOI: 10.1080/0067270X.2016.1220056

**Bandama, F.**, Moffett, A.J., Thondhlana, T.P. and Chirikure, S. 2016. The production,



distribution and consumption of metals and alloys at Great Zimbabwe. *Achaeometry* (Now available online) DOI: 10.1111/arc.12248.

Chirikure, S., **Bandama, F.**, House, M., Moffett, A., Mukwende, T. and Pollard, A.M. 2016. Decisive evidence for multi-directional evolution of socio-political complexity in southern Africa. *African Archaeological Review* 33 (1): 75-95.

Chirikure, S., **Bandama, F.**, Chipunza, K., Mahachi, G., Matenga, E., Mupira, P. and Ngoro, W. 2016. Seen but Not Told: Re-mapping Great Zimbabwe Using Archival Data, Satellite Imagery and Geographical Information Systems. *Journal of Archaeological Method Theory*: 1-25 (Now available online) DOI 10.1007/s10816-016-9275-1.

Mathoho, E.N., **Bandama, F.** and Chirikure, S. 2016. A technological and anthropological study of iron production in Venda, Limpopo Province, South Africa. *Azania: Archaeological Research in Africa* 51 (2): 1-23.

**Bandama, F.** Hall, S. and Chirikure, S. 2015. Eiland crucibles and the earliest relative dating for tin and bronze working in southern Africa. *Journal of Archaeological Science* 62: 82-91.

Chirikure, S., Manyanga, M., Pollard, A.M., **Bandama, F.**, and Mahachi, G. and Pikirayi, I. 2014. Zimbabwe Culture before Mapungubwe: New Evidence from Mapela Hill, South-Western Zimbabwe. *Plosone* 9 (10): 1-18.

Chirikure, S. and **Bandama, F.** 2014. Indigenous African Furnace Types and Slag Composition—Is there a Correlation? *Archaeometry* 56 (2): 296–312.

**Bandama, F.** Chirikure, S. and Hall, S. 2013. Ores sources, smelters and archaeometallurgy: exploring Iron Age metal production in the Southern Waterberg.

*Journal of African Archaeology* 11 (2): 243–267.

Chirikure, S., Pollard, M., Manyanga, M. and **Bandama, F.** 2013. A Bayesian chronology for Great Zimbabwe: re-threading the sequence of a vandalised monument. *Antiquity* 87: 1-19.

## Publications 2: Book chapters

**Bandama, F.** 2013. A reappraisal of Stone Age hunter gatherer research in Zimbabwe with a special focus on the later periods in eastern Zimbabwe. Manyanga, M. and Katsamudanga, S. *Zimbabwean archaeology in the post independence era*. Harare: SAPESS TRUST: 17-36.

Chirikure, S., Thondhlana, T. and **Bandama, F.** 2013. Archaeometallurgical studies: overview and recent approaches. Manyanga, M and Katsamudanga, S. *Zimbabwean archaeology in the post independence era*. Harare: SAPESS TRUST: 143-158.

## Grants and awards

**2016:** National Research Foundation (NRF) Post-Doctoral Research Fellowship  
**2015:** National Research Foundation (NRF) Post-Doctoral Research Fellowship  
**2014:** National Research Foundation (NRF) Post-Doctoral Research Fellowship  
**2013:** Wenner Gren, Wadsworth African Fellowship for dissertation write-up  
**2012:** Wenner Gren, Wadsworth African Fellowship for Ph.D. study  
**2012:** University of Cape Town International Scholarship for Ph.D. study  
**2011:** Wenner Gren, Wadsworth African Fellowship for Ph.D. study  
**2011:** University of Cape Town International Scholarship for Ph.D. study  
**2010:** First prize for student poster award at the Joint PANAF-SAFA conference in Dakar, Senegal  
**2010:** University of Cape Town Conference Travel Grant  
**2010:** Wenner Gren, Wadsworth African Fellowship for Ph.D. study  
**2010:** University of Cape Town International Scholarship for Ph.D. study  
**2009:** National Research Foundation Grandholder linked bursary for MSc study

## Conference presentations

**Bandama, F. 2016.** Iron fabrication during the *Age* of tin and bronze in the southern Waterberg. Paper presented at the SAFA Conference held in Toulouse, France.

**Bandama, F. 2015.** Metal is king; and forks and spoons are a solution to hunger. Separating activity from achievement in the production and consumption of metals at Great Zimbabwe. Paper presented at the ASAPA Conference held in Harare, Zimbabwe.

**Bandama, F. 2014a.** From bloom to bangle: The fabrication and consumption of iron in the southern Waterberg during the Late Iron Age. Paper presented at the joint PANAF-SAFA Conference held in Johannesburg, South Africa.

Mohapi, M., **Bandama, F.**, Mathoho, E. and Chirikure, S. **2014a.** The archaeological survey of the Royal Bafokeng Nation land, Rustenburg, North West Province. Paper presented at the joint PANAF-SAFA Conference held in Johannesburg, South Africa.

**Bandama, F. 2013a:** The innovation of tin and bronze production in southern Africa: Findings from Rhenosterkloof 3 in the Southern Waterberg. Paper presented at the ASAPA Conference held at the University of Botswana, Botswana.

**Bandama, F. 2013b:** Indigenous copper smelting as a vehicle for teaching science and technology in Africa. Paper presented at the 21<sup>st</sup> Annual Meeting of the Southern African Association for Research in Mathematics, Science and Technology Education held at the University of Western Cape, South Africa.

**Bandama, F. 2012:** The archaeology of pre-colonial tin and bronze working in southern Africa. Paper presented at the Ninth International Mining History Conference held in Johannesburg, South Africa.

**Bandama, F. 2011a:** Southern African metallurgy and global network connections. Paper presented at the African Archaeological Materials Research Workshop held at the University of Cape Town, South Africa.

**Bandama, F. 2011b:** An exploratory study of metal working in the Late Iron Age of the

Sand River valley, Southern Waterberg. **Paper presented at the ASAPA Conference in Swaziland.**

**Bandama, F. 2010a:** Metal working in the Sand River valley of the Southern Waterberg, Limpopo Province. Preliminary findings from Rhenosterkloof 1 and 2. **Paper presented at the joint PANAF-SAFA Conference in Dakar, Senegal.**

**Bandama, F. 2010b:** Indigenous iron production in South Africa: An archaeometallurgical investigation of metal working at Rhenosterkloof 1, Limpopo Province, South Africa. **Poster presented at the joint PANAF-SAFA Conference in Dakar, Senegal (won the first prize).**

**Bandama, F. 2009a:** Indigenous iron production in South Africa: The case of Rhenosterkloof. **Poster presented on the University of Cape Town Postgraduate Science Faculty Symposium, South Africa.**

**Bandama, F. 2009b:** The Character of Later Stone Age assemblages from eastern Zimbabwe: some insights from Gwenzi, Manjowe, Manjowe 1 and Diana's Vow. **A paper presentation at the Zimbabwean Prehistory Society in Harare, Zimbabwe.**

## **Selected research and fieldwork**

**2016** Archaeological excavations at Mapela and Great Zimbabwe, Zimbabwe. **In collaboration with Prof S. Chirikure (University of Cape Town), P. Fredriksen (University of Oslo) and the National Museums and Monuments of Zimbabwe.**

- Responsible for mapping of terraces and excavation areas at Mapela
- Responsible for mapping and integrating new stone walls not found in the published literature about Great Zimbabwe.
- Responsible for supervising the field accessioning and sorting of artefacts.
- Manuscripts being prepared for journal publications based on this work

**2015** Ethnographic surveys and documentation of indigenous potting amongst the Tsonga, Sotho and Venda of northern South Africa. **In collaboration with Dr P.**

**Fredriksen (University of Oslo).**

- Responsible for local knowledge and language interpretation.
- Responsible for mapping of potting locales, clay sources and homesteads.
- Journal article on this work has already been published in the *Azania: Researches in Africa's* Special issue on Mobility.

**2014a** Archaeological excavations at Khami and Little Mapela, Zimbabwe. **In collaboration with Prof S. Chirikure (University of Cape Town), P. Fredriksen (University of Oslo) and the National Museums and Monuments of Zimbabwe.**

- Responsible for mapping the two sites (maps found in the MSc and Ph.D. dissertations for respective students).
- Responsible for supervising the field accessioning and sorting of artefacts.
- Publications being prepared for journal submissions.

**2014b** Archaeological excavations at Great Zimbabwe. **In collaboration with Prof S. Chirikure (University of Cape Town) and Dr Mahachi, G. and Mupira, P. (National Museums and Monuments of Zimbabwe).**

- Responsible for supervising the field accessioning and sorting of artefacts.
- Responsible for field training of honours and masters on the use of the Portable X-ray Fluorescence machine.
- Publication (Bandama et al. 2016: refer to Publications 1 of this CV).

**2013a** Archaeological surveys of the Royal Bafokeng Nation Land, North West province South Africa. **In collaboration with Prof S. Chirikure (University of Cape Town).**

- Responsible for desktop mapping of the stone walled sites
- Responsible for training an honours student (graduated in 2014) on field methods and site interpretation for her dissertation.

**2013b** Archaeological excavations at Mapela, an early 2<sup>nd</sup> Millennium AD site in the Shashe-Limpopo, Zimbabwe. **In collaboration with Prof S. Chirikure and Dr M.**



**Manyanga (Midlands State University).**

- Responsible for mapping the site (maps found in the Honours dissertation for the students and in the subsequent publication: see Chirikure et al. 2014).
- Responsible for supervising the field accessioning and sorting of artefacts.

**2013c** Documentation and auditing of archaeological material excavated from the valley enclosures at Great Zimbabwe. **In collaboration with Prof S. Chirikure.**

- Responsible for desktop mapping of the site based on archival maps and satellite imagery.
- Responsible for field training of honours and masters on the use of the Portable X-ray Fluorescence machine.
- Publications on this work already out (see Chirikure et al 2016 and Bandama et al 2016, in Publications 1 of this CV).

**2011** Archaeological excavations at Rhenosterkloof 2, Rhenosterkloof 3 and Tembi 1 in the Southern Waterberg, Limpopo Province of South Africa. **Principal investigator.**

- Conducted pre-field research on the sites.
- Supervised and directed field personnel on reconnaissance and excavations at the three sites.
- Taught field students in archaeological field techniques.

**2010** Archaeological surveys in the Southern Waterberg, Limpopo Province of South Africa. **Principal investigator.**

- Conducted pre-field research on the sites.
- Supervised and directed field personnel on reconnaissance and surveys.
- Taught field students in archaeological field techniques.

**2009** Archaeological excavations at Rhenosterkloof 1 in Southern Waterberg, Limpopo Province of South Africa. **Principal investigator.**

- Conducted pre-field research on the sites.

- Supervised and directed field personnel on reconnaissance and excavations at the three sites.
- Taught field students in archaeological field techniques.

## Professional associations

**2010-present:** Society of Africanist Archaeologists (SAFA)

**2012-present:** Association of Southern African Professional Archaeologists (ASAPA)

## Referees

### 1. Professor Judith Sealy

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### 2. Associate Professor Shadreck Chirikure

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### 3. Associate Professor Simon Hall

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CTS HERITAGE

**APPENDIX 5: HWC Fossil Finds Procedure**

## **HWC PROCEDURE: CHANCE FINDS OF PALAEOLOGICAL MATERIAL**

### **June 2016**

#### **Introduction**

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

#### **Training**

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO

It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

#### **Actions to be taken**

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.



### **Procedure to follow if it is likely that the material identified is a fossil:**

- i. The ECO or site agent must ensure that all **work ceases** immediately in the vicinity of the area where the fossil or fossils have been found;
- ii. The ECO or site agent must **inform HWC of the find immediately**. This information must include photographs of the findings and GPS co-ordinates;
- iii. The ECO or site agent must compile a **Preliminary Report and fill in the Fossil Discoveries: HWC Preliminary Record Form** within 24 hours without removing the fossil from its original position. The **Preliminary Report** records basic information about the find including:
  - The date
  - A description of the discovery
  - A description of the fossil and its context (e.g. position and depth of find)
  - Where and how the find has been stored
  - Photographs to accompany the preliminary report (the more the better):
    - A scale must be used
    - Photos of location from several angles
    - Photos of vertical section should be provided
    - Digital images of hole showing vertical section (side);
    - Digital images of fossil or fossils.

Upon receipt of this **Preliminary Report**, HWC will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

- v. **Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags.** This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilisation.
- vi. If the find cannot be stabilised, **the fossil may be collect with extreme care** by the ECO or the site agent and put aside and protected until HWC advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until HWC has indicated, in writing, that it is appropriate to proceed.

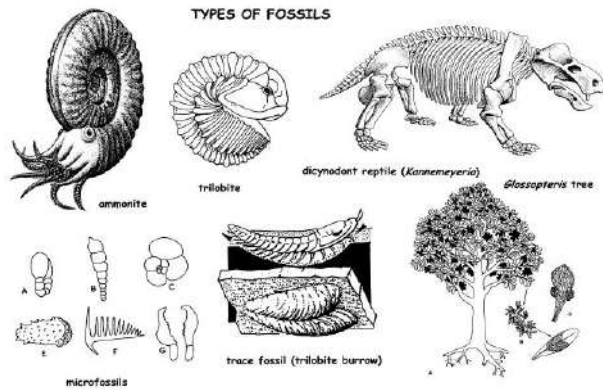
**FOSSIL DISCOVERIES: HWC PRELIMINARY RECORDING FORM**

|  |  |       |
|--|--|-------|
| <b>Name of project:</b>  |  |       |
| <b>Name of fossil location:</b>  |  |       |
| <b>Date of discovery:</b>  |  |       |
| <b>Description of situation in which the fossil was found:</b>                 |  |       |
| <b>Description of context in which the fossil was found:</b>                   |  |       |
| <b>Description and condition of fossil identified:</b>                         |  |       |
| <b>GPS coordinates:</b>  | Lat:                                     | Long: |
| <b>If no co-ordinates available then please describe the location:</b>         |  |       |
| <b>Time of discovery:</b>  |  |       |
| <b>Depth of find in hole</b>   |  |       |
| <b>Photographs (tick as appropriate and indicate number of the photograph)</b> | Digital image of vertical section (side) |       |
|  | Fossil from different angles             |       |
|  | Wider context of the find                |       |
| <b>Temporary storage (where it is located and how it is conserved)</b>         |  |       |
| <b>Person identifying the fossil</b>   | Name:<br>Contact:                        |       |
| <b>Recorder</b>  | Name:<br>Contact:                        |       |
| <b>Photographer</b>  | Name:<br>Contact:                        |       |

## Palaeontology: what is a fossil?

Fossils are the traces of ancient life (animal, plant or microbial) preserved within rocks and come in two forms:

- Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and
- Trace fossils such as trackways and burrows record ancient animal behaviour.



### How to report chance fossil finds: What should I do if I find a fossil during construction/mining?

If you think you have identified a fossil:

Immediately inform the ECO or Site Agent. He/she will then contact HWC and write a report and if necessary operations will stop in that specific area until the fossil is recovered

Heritage Western Cape  
[ceoheritage@westerncape.gov.za](mailto:ceoheritage@westerncape.gov.za)

021 483 5959

[www.hwc.org.za](http://www.hwc.org.za)

Ilifa le-Indaba ka-Imizimba ka-Imizimba  
Erfenis Wes-Kaap  
Heritage Western Cape

## Types of palaeontological finding - What does a fossil look like?

Fossils vary in size, from fossilised tree trunks and dinosaur bones down to very small animals or plants. Finds can be **individual fossils** (one isolated wood log or bone) or **clusters and beds** (several bones, teeth, animal or plant remains, trace fossils in close proximity or bones resembling part of a skeleton). A bed of fossils is a layer with many fossil remains.

Below there is a list of few examples of fossils which may be identified during excavations in the Western Cape.

| Image | Description  | Image | Description  |
|-------|--|-------|--|
|       | Leaves   |       | Snail shells and other shells                                      |
|       | Fossil wood  |       | Bones of larger animals  |
|       | The remains of fish and marine life (e.g. teeth, scales, starfish) |       | Large burrows made by moles and other animals                      |
|       | Stromatolites  |       | Traces made by burrowing insects (ants, wasps, dung-beetles etc.). |
|       | Animal footprints  |       |  |

Images provided by Dr John Almond

Text by HWC's Archaeology, Palaeontology & Meteorites Committee June 2016

