

**Phase 1 Heritage Impact Assessment for proposed new
1.5 km-long underground sewerage pipeline in Paul
Roux, Thabo Mofutsanyane District Municipality, Free
State Province.**

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Summary

A heritage impact assessment was carried for a proposed new 1.5 km-long underground sewerage pipeline in Paul Roux in the Thabo Mofutsanyane District Municipality, Free State Province. The study area is situated on the farm Farm Mary Ann 712, next to the N5 national road covering a section of the Sand River floodplain which is located on the eastern outskirts of Paul Roux . The proposed footprint is underlain by well-developed alluvial and geologically recent overbank sediments of the Sand River. Investigation of exposed alluvial cuttings next to the bridge crossing shows little evidence of intact Quaternary fossil remains. Potentially fossil-bearing Tarkastad Subgroup and younger Molteno Formation strata are exposed to the southwest of the study area. These outcrops will not be impacted by the proposed development. There are no major palaeontological grounds to suspend the proposed development. The study area consists for the most part of open grassland currently used for cattle grazing. The foot survey revealed little evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no indications of rock art, prehistoric structures or other historical structures or buildings older than 60 years within the vicinity of the study area. A large cemetery is located directly west of the proposed footprint. The modern bridge construction at the Sand River crossing is not considered to be of historical significance. **The N5 river crossing as well as the associated 10 m - wide sections of alluvium flanking both sides of the river at the bridge is designated a site rating of Generally Protected A.** It is the author's opinion that the development can proceed, provided that a professional archaeologist is appointed to monitor excavations at the river crossing as well as 10 m wide sections of alluvium flanking both sides of the river at the bridge. **The rest of the linear footprint is designated a site rating of Generally Protected C.**

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Introduction

A heritage impact assessment was carried for a proposed new 1.5 km-long underground sewerage pipeline in Paul Roux in the Thabo Mofutsanyane District Municipality, Free State Province (**Fig. 1**). The study is required in terms of Section 38 of the National Heritage Resources Act 25 of 1999 as a prerequisite for any development which will change the character of a site exceeding 5 000 m² in extent. The task involved identification and mapping of possible heritage remains within the proposed project area, an assessment of their significance, related impact by the proposed development and recommendations for mitigation where relevant.

Terms of Reference

- Identify and map possible heritage sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Methodology

The heritage significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature. This was followed by a field assessment by means of a pedestrian survey. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant palaeontological and archaeological information, aerial photographs (Google Earth) and site records were consulted and integrated with data acquired during the on-site inspection. The study area is rated according to field rating categories as prescribed by SAHRA (**Table 2**).

Locality Data

1 : 50 000 scale topographical map 2827 DB Paul Roux

1 : 250 000 scale geological map 2826 Winburg

Locality: Farm Mary Ann 712

General site coordinates (**Fig. 2**):

A) 28°18'23.36"S 27°57'23.20"E

B) 28°18'5.69"S 27°57'22.98"E

C) 28°17'57.69"S 27°57'41.86"E

D) 28°17'47.17"S 27°57'54.04"E

The study area is situated on the farm Farm Mary Ann 712, next to the N5 national road covering a section of the Sand River floodplain which is located on the eastern outskirts of Paul Roux (**Fig. 2**). The terrain is largely exposed to cattle grazing and other general residential activities (**Fig. 3**),

Geology

The geology of the region has been described by Nolte (1995). The area to the east and south of Paul Roux is underlain by sedimentary rocks of the Molteno, Elliot and Clarens Formations (Stormberg Group), with mudstones and sandstones of the older (*Trt*, Beaufort Group, Karoo Supergroup) exposed lower down in the sequence. Rocks of the Molteno Formation follow conformably on those of the Tarkastad Subgroup, and consist of various upward-fining sandstone units (**Fig. 4**). Jurassic- age dolerite intrusions are common in the region with outcrop indicated west and east of the study area (as indicated on the 1 : 250 000 scale geological map of the area (2826 Winburg).

The study area is for the most part underlain by younger, superficial and geologically recent sediments. Quaternary deposits in the region consist mainly of river channel alluvium, residual soils and unconsolidated scree along mountainsides. The alluvial deposits along the Sand River are mostly made up of grey and red to pale-yellow sandy clays reaching a thickness of up to 3 m in places (**Fig. 5**).

Background

Palaeontology

Tarkastad Subgroup exposures in the region are generally accepted to be Early to early Middle Triassic in age of which the upper two thirds of the sequence are assigned to the *Cynognathus* Assemblage Zone (Kitching 1977; 1995) (**Fig. 6**). This AZ is characterized by the presence of the therapsids *Cynognathus*, *Diademodon*, and

Kannemeyeria. Fossils primarily occur as in mudrock units as dispersed and isolated specimens, frequently associated with calcareous concretions. An abundance of plant fossils as well as several insect genera have been identified within the overlying Moltano Formation, but it has not as yet yielded any tetrapods. Karoo vertebrate fossil sites within 10 km from Paul Roux include the farms Uniondale 867 and Vergenoeg 1492.

Quaternary alluvial deposits found along river valleys in the north-eastern Free State, are characterized by extensive erosion in the form of dongas, and are known to occasionally contain late Pleistocene vertebrate remains and even localized death assemblages (e.g. alcelaphine remains at Heelbo near Senekal). Quaternary fossil localities within 10 km from Paul Roux include the farms Fialy 1441 and Mispah 155.

Archaeology

The archaeological footprint in the region is primarily dominated by Late Iron Age stone- wall complexes (**Fig. 7**), but surface scatters of Later Stone Age and Middle Stone Age artifacts are also frequent archaeological components along erosional gullies (dongas) of rivers and streams in the region. The incidence of surface scatters usually decreases away from localized areas such as riverine sites and dolerite-shale contact zones. Away from riverine contexts, Stone Age artifacts generally occur as contextually derived individual finds in the open veld. Two partially intact Later Stone Age sites have previously been recorded within the alluvial overbank sediments of the Sand River and south of the proposed impact area (**Fig. 8 – 10, Table 1**). The character and typology of the material suggest that both sites represent Holocene microlithic assemblages.

Several rock art localities, containing depictions of human figures, have been recorded in the Witteberge southeast of Paul Roux. A variety of stone dagga pipes have been collected in the region, including engraved sandstone and mudstone pipes, as well as a number made of baked clay.

Stone enclosures found on and around dolerite koppies along the Liebenbergvlei, Vals, and Sand River valleys between Senekal and Bethlehem, exhibit telltale signs of basic structural units including huts, large enclosures, pieces of walling and stone circles related to Late Iron Age settlements in the area. These sites were occupied from as early as the sixteenth and seventeenth centuries and represent a system that can be broadly attributed to groups ancestral to the Sotho-speaking people of today

(Maggs 1976). Extensive Iron Age settlements have been recorded in the region, such as at Palmietfontein 5 and Three Sisters 1191. Remnants of what is possibly a complex of Iron Age middens is located near about 800 m to the west of the study area (**Fig 8, 11 & 12, Table 1**). Hardly any stone structures are visible, but pottery and bone are noticeable on the surface of the terrain. Pottery (fragments), including pieces with comb-stamped, herring-bone bands around short necks and rounded rims are present on the surface and in association with dental fragments including an upper molar of *Bos taurus*. The site falls within the distributional range of the Type V settlement pattern, a 16th or 17th to 19th century old structural design, which is the most common and widely distributed Late Iron Age settlement pattern on the southern Highveld (Maggs 1976).

More recent visual heritage in the area include a monument on the farm Tevrede commemorating children who died of measles during the Great Trek as well as a number of farm buildings and sites associated with the Anglo-Boer War of 1899 – 1902 (e.g. the Battle of Biddulphsberg ca.1900, about 16 km east of Senekal).

Field Assessment

Palaeontology

The proposed footprint is underlain by well-developed alluvial and geologically recent overbank sediments of the Sand River. Investigation of exposed alluvial cuttings next to the bridge crossing shows little evidence of intact Quaternary fossil remains (**Fig. 13 & 14, Area 2**). Potentially fossil-bearing Tarkastad Subgroup and younger Molteno Formation strata are exposed to the southwest of the study area. These outcrops will not be impacted by the proposed development.

Archaeology

The study area consists for the most part of open grassland currently used for cattle grazing. The foot survey revealed little evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no indications of rock art, prehistoric structures or other historical structures or buildings older than 60 years within the vicinity of the study area. A large cemetery is located directly west of the proposed footprint. The modern bridge construction at the Sand River crossing is not considered to be of historical significance (**Fig. 13.**)

Impact Statement

Palaeontology

The area is underlain by Quaternary overbank sediments (alluvium) and recent residual soils. The respective microlithic assemblages previously recorded within the alluvial package higher up along the river suggest a late Holocene depositional age (*TPQ*) for these deposits. Impact on potential Quaternary fossil remains is considered low. Impact on Karoo Supergroup fossil remains is considered low due to the well-developed Quaternary overburden covering the study area, but possible negative impacts may occur when trench excavations into these fossil-bearing strata are required during the construction phase of the project. The proposed development is considered long term with the possible consequence that any damage or destruction to potential palaeontological material within the affected area will be permanent.

Archaeology

The area is underlain by late Quaternary (Holocene) overbank sediments (alluvium) and recent residual soils. The footprint in general is regarded as of low archaeological significance with the exception of the exposed alluvial cuttings next to the bridge crossing, which is regarded as of potentially high archaeological sensitivity following to the previous documentation of Holocene microlithic assemblages eroding out the overbank deposits higher up along the river.

Recommendation

Palaeontology

There are no major palaeontological grounds to suspend the proposed development.

Archaeology

The river crossing as well as 10 m wide sections of alluvium flanking both sides of the river at the bridge is designated a site rating of Generally Protected A (**Table 2**). It is the author's opinion that the development can proceed, provided that a professional archaeologist is appointed to monitor excavations at the river crossing as well as 10 m wide sections of alluvium flanking both sides of the river at the bridge (**Fig. 14**).

The rest of the linear footprint is designated a site rating of Generally Protected C.

References

- Kitching, J.W. 1977. The distribution of Karoo Vertebrate Fauna. Bernard Price Institute for Palaeontological Research. Memoir 1, 1 – 131.
- Kitching 1995. Biostratigraphy of the Dicynodon Assemblage Zone **In**. Rubidge, B. S. (ed.) *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 1, 1 – 45.
- Maggs, T.C. 1976. *Iron Age communities of the southern Highveld*. Occasional Papers of the Natal Museum No. 2.
- Nolte, C.C. 1995. The geology of the Winburg area. Geological Survey of South Africa. Council for Geoscience.
- Rubidge, B. S. 1995 (Ed) *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 1, 1 – 46.
- SAHRA, 2005. Minimum Standards for the Archaeological and the Palaeontological Components of Impact Assessment Reports.

DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. I have no interest in secondary or downstream developments as a result of the authorization of this project.

Yours truly,

A handwritten signature in black ink, appearing to read 'L Rossouw', written in a cursive style.

16 March 2020

Tables and Figures

Table 1. Locality of archaeological features previously recorded by the author of this report.

#	Feature	Coordinates
1	LSA Exposure	28°18'57.21"S 27°57'44.50"E
2	LSA Exposure	28°18'33.38"S 27°57'34.47"E
3	Pottery	28°18'26.81"S 27°57'1.51"E
4	Pottery and bone	28°18'28.00"S 27°57'2.16"E
5	Pottery	28°18'31.81"S 27°57'3.60"E
6	Pottery and bone	28°18'36.05"S 27°57'1.43"E
7	Pottery and bone	28°18'35.69"S 27°57'4.77"E

Table 2. Field rating categories as prescribed by SAHRA (2005).

Field Rating	Grade	Significance	Mitigation
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

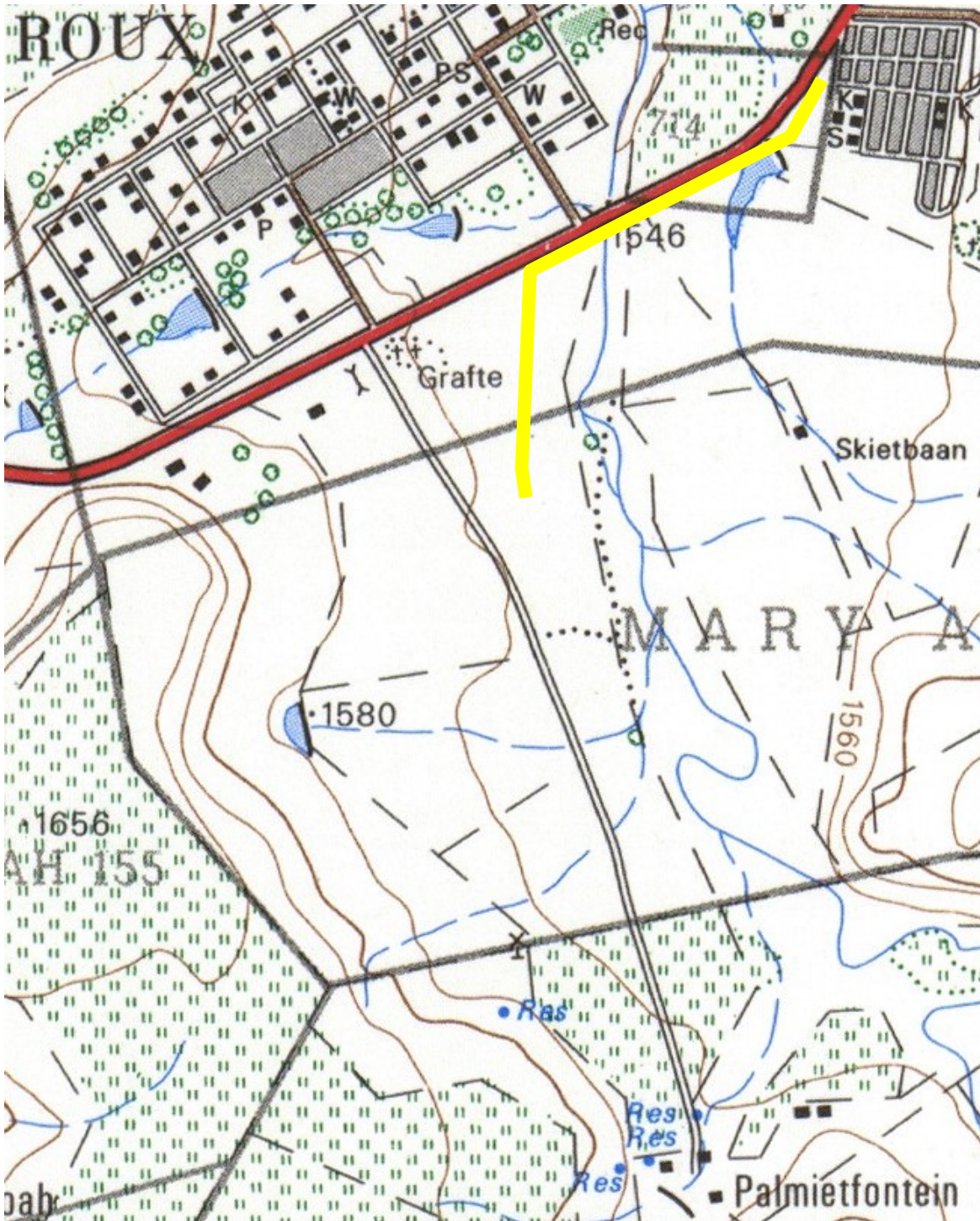


Figure 1. Map of the proposed sewerage pipeline route marked by yellow line (portion of 1:50 000 scale topographic map 2827 DB Paul Roux).



Figure 2. Aerial view of the proposed sewerage pipeline route.



Figure 3. Degraded terrain largely used for cattle grazing and other general residential activities

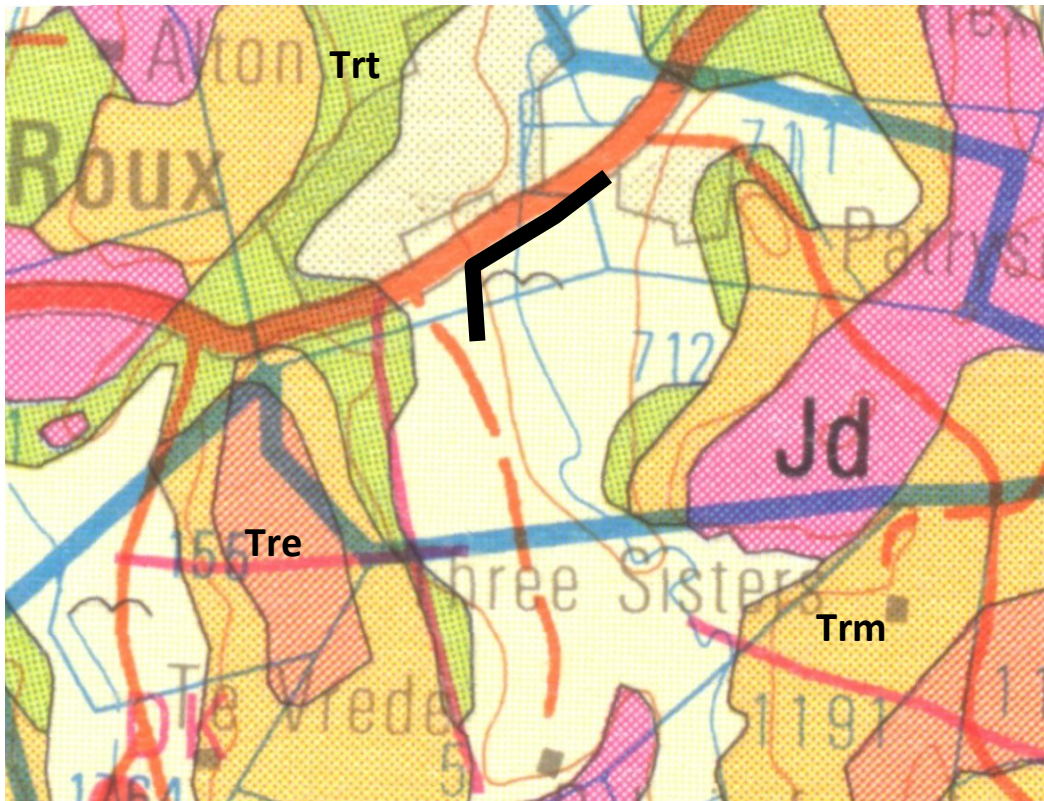


Figure 4. According to the 1:250 000 scale geological map 2826 Winburg (above), the development footprint (black line) is capped by river channel alluvium (flying bird symbol above) , indicated as green area by SAHRIS palaeosensitivity map (below).



Figure 5. Exposed river channel alluvium, looking south (above) and south west (below).

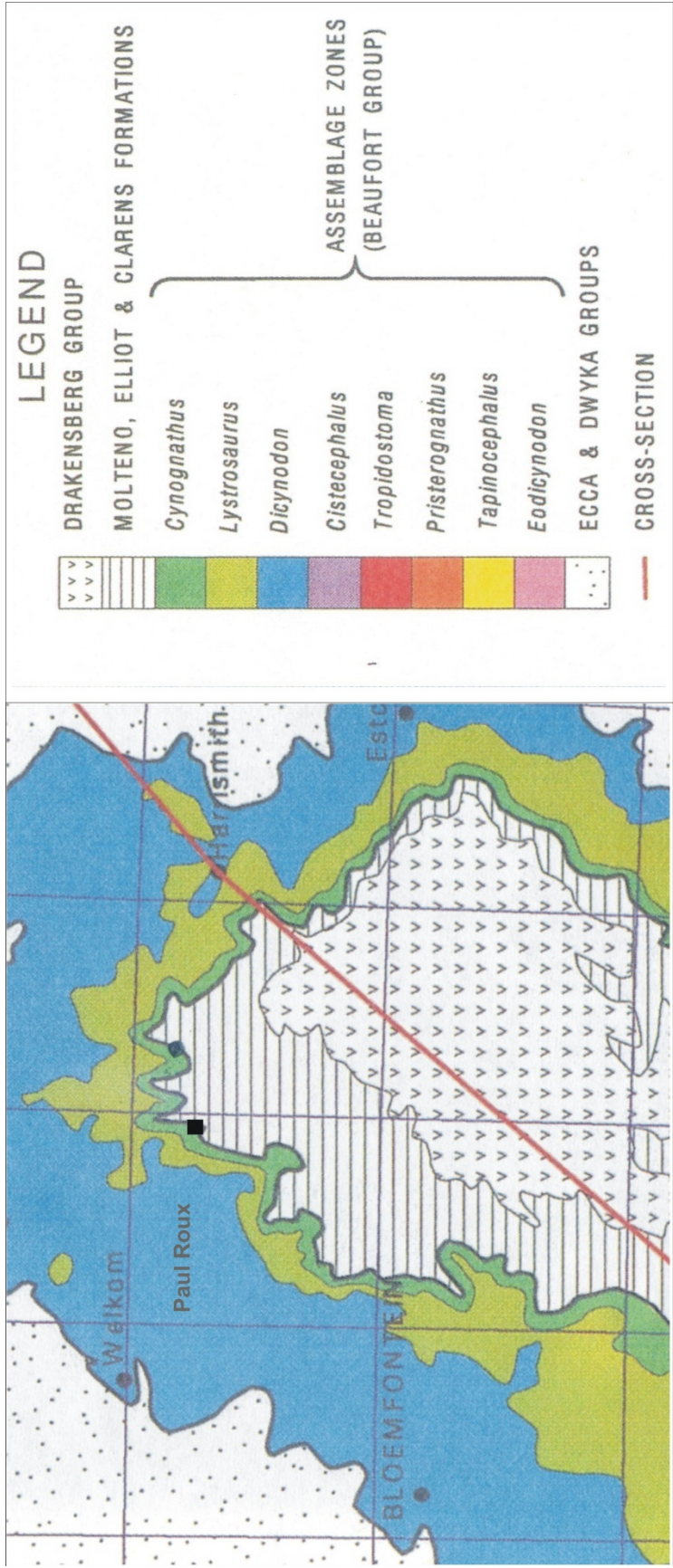


Figure Geographical distribution of vertebrate biozones in the Beaufort Group (after Rubidge 1995).

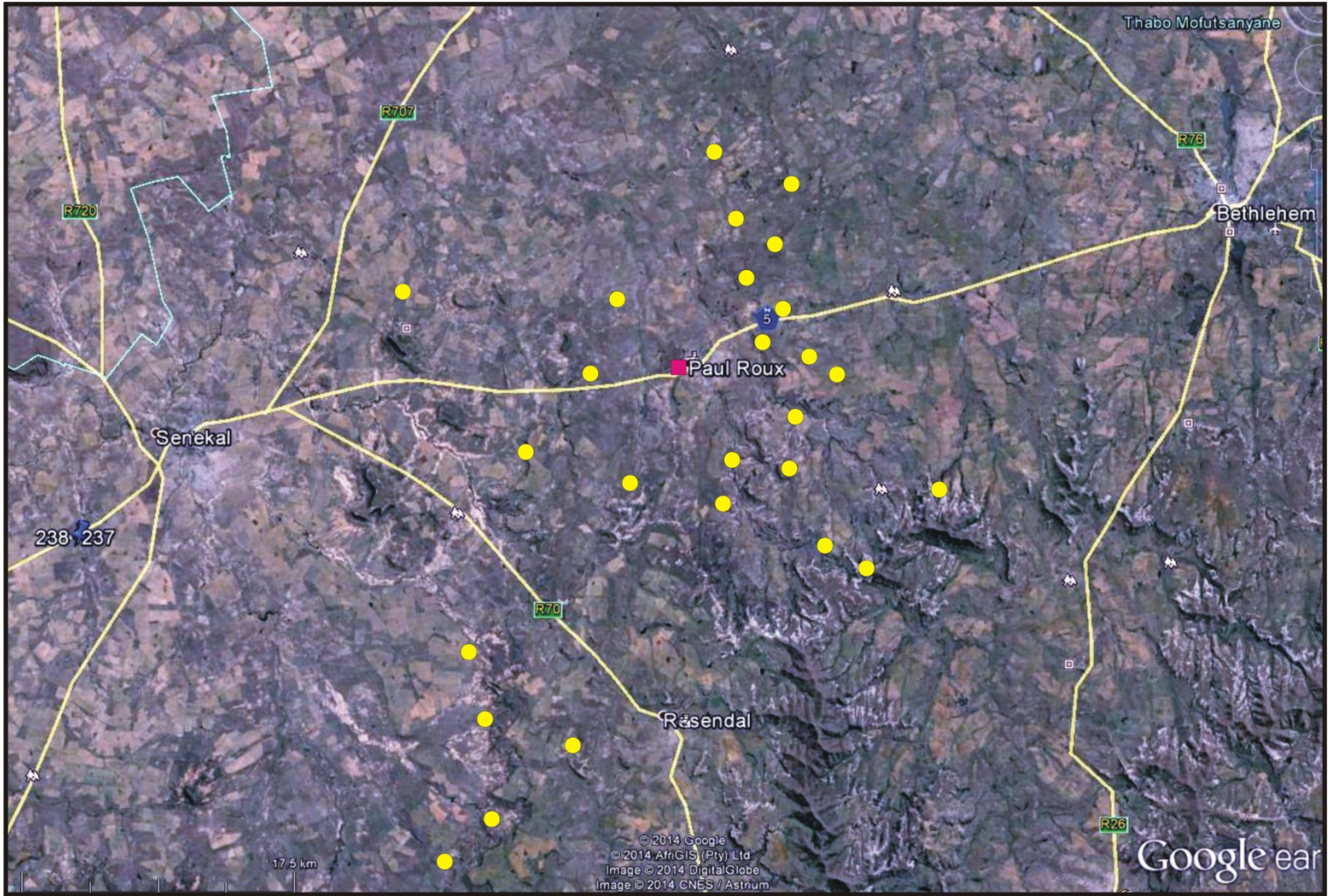


Figure 7. Distribution of Late Iron Age sites near Paul Roux (after Maggs 1976).



Figure 8. Aerial view of Later Stone Age localities (white stars) and Late Iron Age terrain (yellow circle) previously recorded by the author.



Figure 9. Intact microlithic assemblage partially eroded from alluvial package (yellow line).

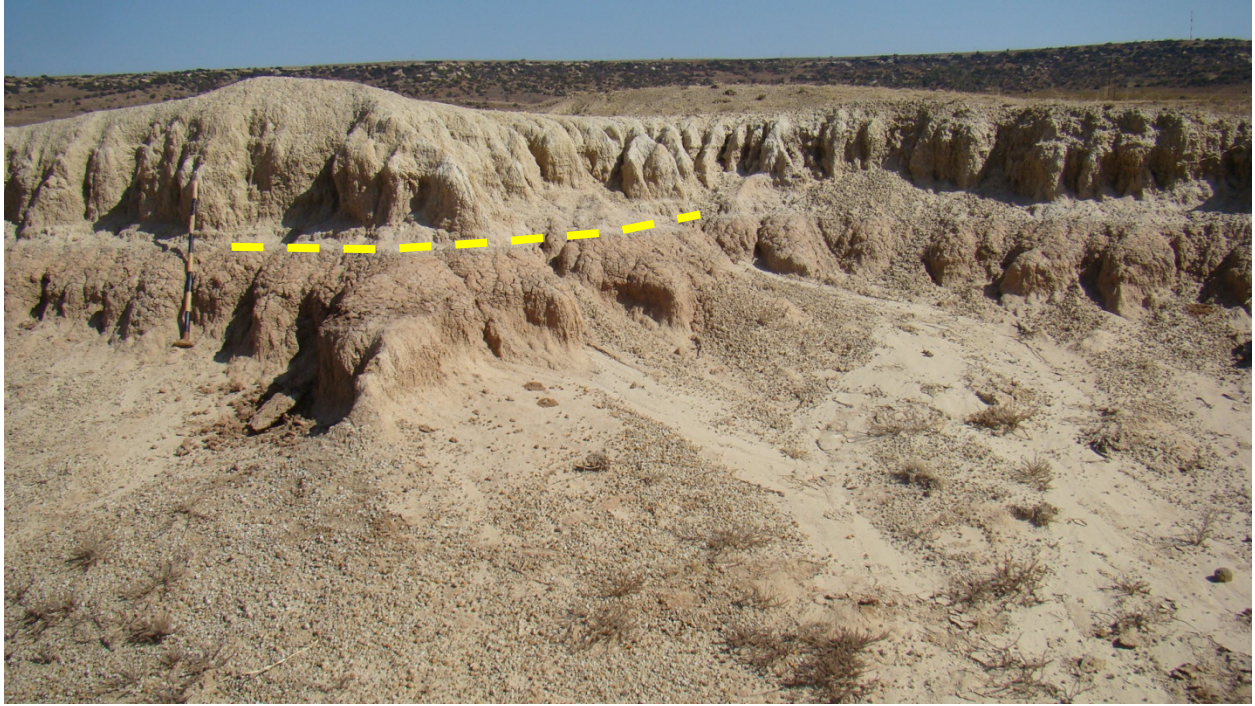


Figure 10. Microlith assemblage located on red-brown palaeosol exposed by river cutting (yellow line)



Figure 11. Localized concentrations of cultural remains.



Figure 12. Stone-build structures (above), animal remains (below left) and pottery (below right).



Figure 13. Modern bridge at Sand River crossing, looking west (above).



Figure 14. River crossing Sand River, looking east-northeast.

Appendix 1: Chance Finds Protocol for Developer

Palaeontology

Any excavations that *exceeds 1 m into bedrock*, will impact *in situ* sedimentary strata which could be palaeontologically sensitive in terms of potential impact on fossils. . “Fossil” means the remains or traces of plants and animals that lived long ago which has been buried and dug up, and most fossils are found where they became buried in layers of sand or mud a long time ago (**Fig. 1 - 3**). “Strata” means layers. And “stratigraphy” is the study and working out of the sequence of the layers of sediment that settled into low-lying areas long ago. “Sediment” means of sand, mud, etc, which settled down. It may still be loose (**see Fig. 7**) or may have consolidated to form rock (**see Fig. 3**). In some fossils the original bone was not lithified. It disappeared completely but left an impression or mould in the sediment (**Fig. 4**). Sometimes leaf impressions are purely a kind of mould and/or cast of a leaf, but often some of the original leaf is left behind in a carbonized form in the impression (**Fig. 5**). Trace fossils, such as footprints, burrows, and trails footprints and tracks provide information such as animal gait, lifestyle and social behavior (**Fig. 6**).

In this case Dr Ragna Redelsdorf at SAHRA must be alerted accordingly since freshly exposed sedimentary rock will require contracting **a professional palaeontologist for appropriate monitoring for fossil remains by** during the construction phase.

If any newly discovered palaeontological resources prove to be significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;

The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.

If, in the event that localized fossil material is discovered exposed or eroding out of *intact superficial overburden* during the construction phase, it will in all probability resemble modern-looking, but more or less lithified animal bones and teeth and it will most likely be those belonging to bovids (Bovidae: the biological family of ruminant mammals that includes wildebeest, buffalo, antelopes, etc.) (**Fig. 7 - 9**).

In the unlikely event of fossil discovery within previously undisturbed Quaternary overburden, a professional palaeontologist must be called in immediately to confirm and record the finds.

If any newly discovered palaeontological resources prove to be significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;

The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.

In the meantime, *ex situ* remains must be wrapped in paper towels or heavy duty tin foil and stored in a safe place. The material should not be washed or cleaned in any way. *In situ* material must be kept in place and protected from further damage by covering it with light but rigid object like a box, bucket or metal sheet until further confirmation by the palaeontologist.

Archaeology

If any evidence of archaeological sites or remains, e.g. stone tool artifacts (**Fig. 10 & 11**), ostrich eggshell fragments, charcoal and ash heaps, or remnants of stone-made structures (**Fig. 12**) or unmarked graves (**Fig. 13**) are found during the proposed development, SAHRA APM Unit (Phillip Hine 021 462 5402) must be alerted.

In the meantime, *potential archaeological structures such as stone-build enclosures, buildings or graves* must be avoided by a no-go buffer zone until further confirmation by the archaeologist. Smaller *in situ* material must be kept in place and protected from further damage by covering it with light but rigid object like a box, bucket or metal sheet.

If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist must be contracted as soon as possible to inspect the findings.

If the newly discovered heritage resources prove to be of archaeological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;

The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.

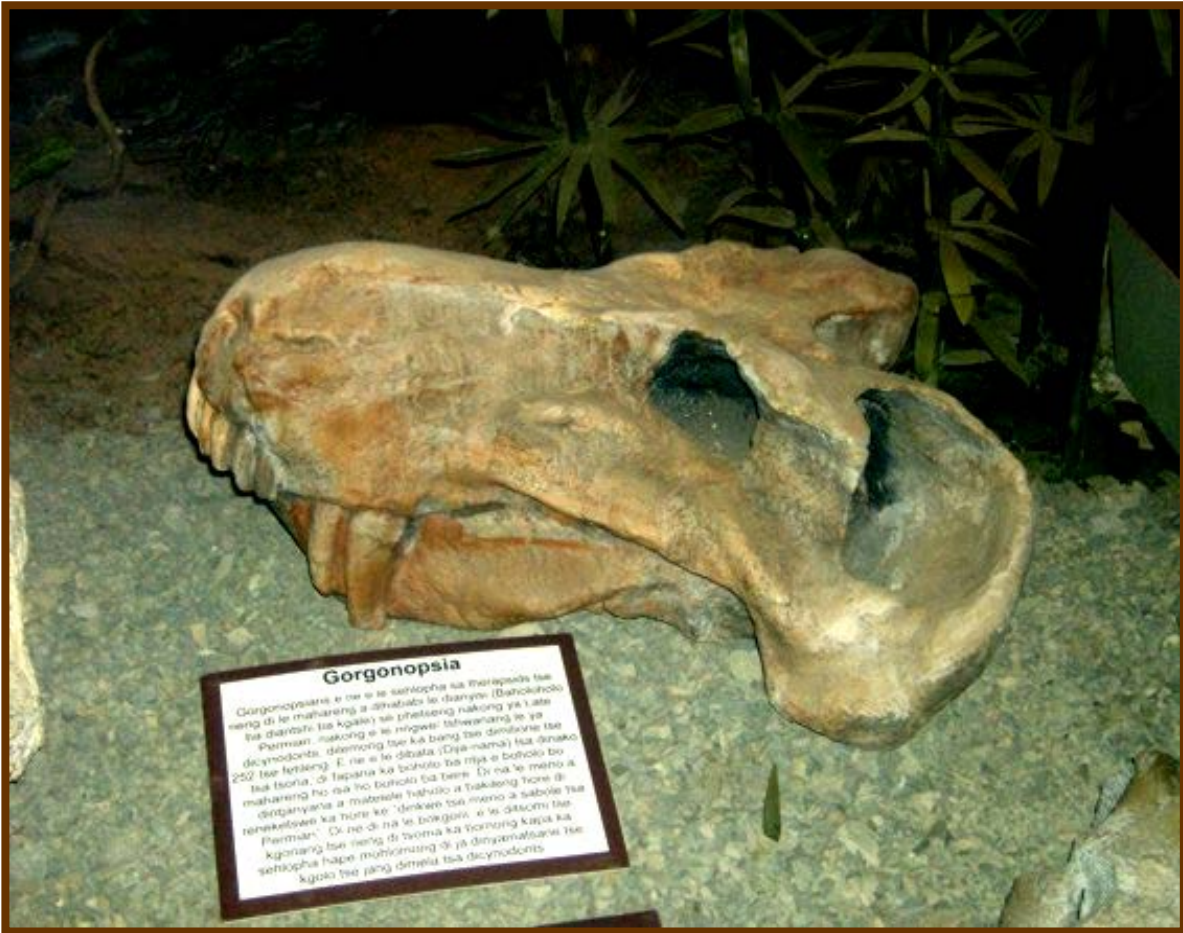


Figure 1. Fossilized skull of a Gorgonopsian, a carnivore which belonged to a large group of animals known as therapsids (or “mammal-like reptiles”). Most therapsids died out in the End-Permian extinction about 252 million years ago.



Figure 2. Petrified tree trunks.



Figure 3. World's oldest known dinosaur egg of *Massospondylus* with perfectly preserved fossilized embryo, around 200 Ma years old, Golden Gate.



Figure 4. The original skull decomposed or dissolved, but left its shape in the sediments, forming a mould. Then sand or other minerals filled the mould and hardened to form an exact replica of the original. When the rock was chopped open, both mould and cast were revealed.



Figure 5. Fossilized leaf impression in mudrock.

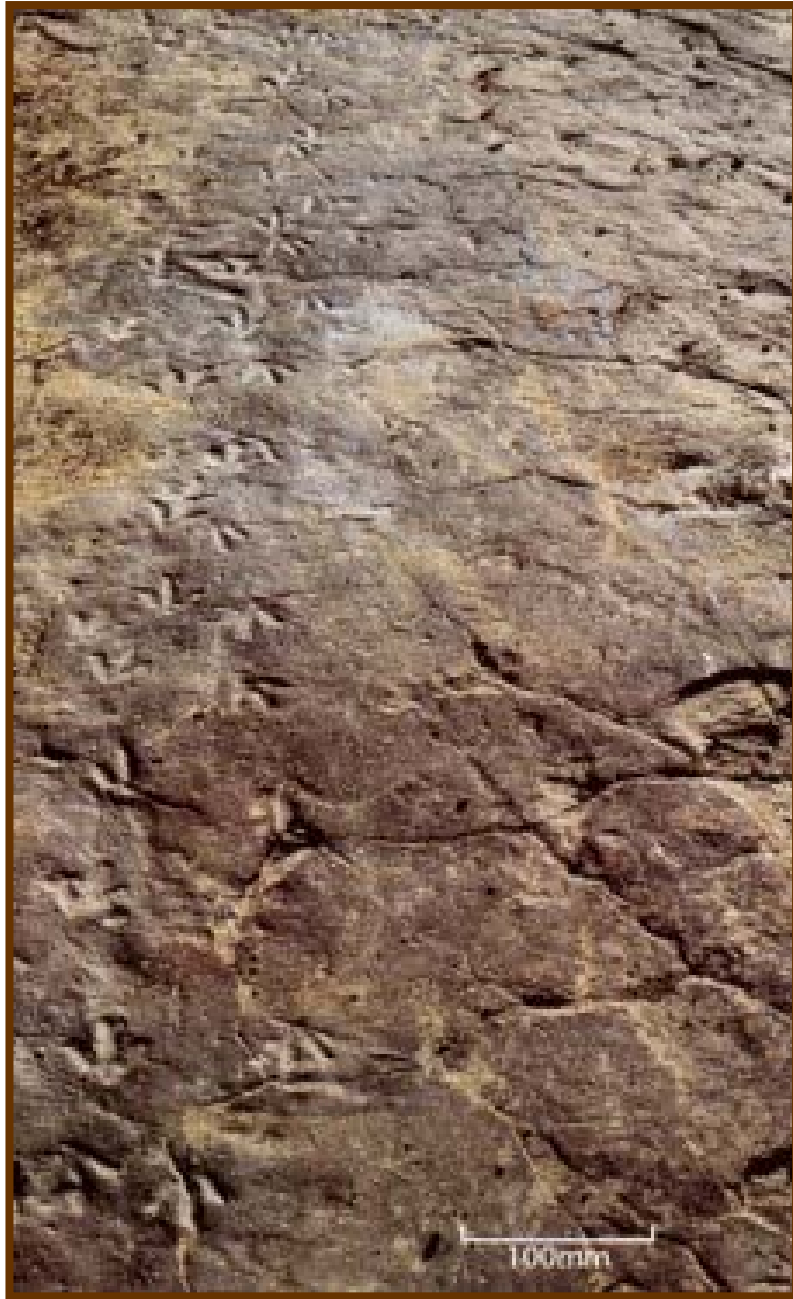


Figure 6. Fossilized footprints and tracks provide information such as animal gait and social behavior..



Figure 7. Example of intact bovid skeletal remains exposed within Quaternary overbank deposits (alluvium) from the Vaal River.



Figure 8. Side view (buccal view) of bovid lower dentition removed from jaw bone. Dentition is one of the most commonly preserved elements amongst Quaternary fossil remains



Figure 9. Example of post-cranial bovid skeletal elements including from left to right: femur, humerus, radius, tibia, scapula and vertebrae (x 3).



Figure 10. Example of general appearance of Stone Age artifacts rarely found intact as open sites and largely derived as isolated scatter on the landscape



Figure 11. Example of rare stone tool knapping site occasionally found near dolerite intrusions in the region.



Figure 12. Example of historical stone-build enclosure frequently found in the region.



Figure 13. Typical example of unmarked grave recorded around Bloemfontein - distinctive mound with occasional head markers and a characteristic **dolerite cobble** dome.