

Palaeontological desktop study for proposed new mining exploration on the farm Lanyonvale 376, Douglas, Northern Cape Province.

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Summary

The desktop investigation indicates that the development footprint is underlain by glacially related Dwyka Group sediments considered to be of low palaeontological sensitivity, that are capped by late Tertiary surface limestones (*T-Qc*) and Quaternary aeolian sands (*Qs*). The surface limestones and geologically recent aeolian sand overburden in the region is generally not considered to be fossiliferous in the absence of pans, springs and well-developed alluvial deposits. As far as the palaeontological heritage is concerned, exploration activities may proceed provided that that investigation of the well-developed Quaternary overbank (alluvial) deposits flanking the banks of the Orange River are accompanied by a phase 1 palaeontological site assessment during the actual exploration phase of the project. In the event of fossil discovery within the Quaternary overburden (i.e. modern-looking but more or less lithified animal bones and teeth), elsewhere during the exploration phase of the development, a professional palaeontologist must be called in immediately to confirm and record the finds. 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.

Introduction

The report is an assessment of potential palaeontological impact with regard to an application for mining exploration of a 2000 ha area located about 46 km west-southwest of Douglas on the farm Lanyonvale 376, Northern Cape Province (**Fig. 1**).

Site Coordinates:

- 1) 29°15'57.20"S 23°20'31.38"E
- 2) 29°14'28.24"S 23°18'21.61"E
- 3) 29°11'43.33"S 23°17'3.43"E
- 4) 29°12'32.60"S 23°19'55.20"E
- 5) 29°13'57.27"S 23°20'35.45"E
- 6) 29°15'35.58"S 23°20'39.61"E

Methodology

The assessment was carried out in accordance with National Heritage Resources Act 25 of 1999 with the aim to assess the potential impact on palaeontological heritage resources that may result from the proposed development. The palaeontological significance of the affected areas were evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Assumptions and Limitations

The assessment provided within this report is based upon a desktop study without the benefit of a site visit. As such, the presentation of geological units present within the study area is derived from the 1:1 000 000 scale map of South Africa and the 1:250 000 scale geological map 2922 Prieska, which may vary in their accuracy. It is also assumed, for the sake of prudence, that fossil remains are always uniformly distributed in fossil-bearing rock units, although in reality their distribution may vary significantly.

Background

According to the 1:250 000 scale geological map 2922 Prieska of the area, the proposed development footprint is underlain by glacially-related sediments of the Mbizane Formation (Dwyka Group, *C-Pd*), a largely heterolithic unit recognized in the upper part of the Dwyka Group of the Karoo Supergroup (Von Brunn & Visser 1999; Johnson et al. 2006) (**Fig. 2**). It is characterized by mudstone and sandstone successions, tillites and conglomerates that were laid down when Dwyka glaciers scoured out valleys and depressions in pre-Karoo rocks during the Permo-Carboniferous, *c.* 300 Ma years ago. Small, isolated exposures of early Vaalian oolitic and stromatolitic platform carbonates (*Vb*, Ghaap Group, Transvaal Supergroup) are located near, but outside the southern boundary of the footprint (Beukes

1979) (**Fig. 3**, red line). The Mbizane Formation is not considered to be highly fossiliferous, but low diversity non-marine ichnofossil assemblages have been recorded as well as scarce vascular plant remains associated with *Glossopteris* Flora, while palynomorphs are also likely to be present within finer-grained mudrock facies (Almond and Pether 2008). Superficial deposits are primarily represented by late Tertiary surface limestones (*T-Qc*), windblown Kalahari Group sand (*Qs*), surface gravels and alluvium. The Middle and Lower Gariep basin cuts through a series of post-Karoo fluvial remnants. To the west of Prieska the landscape is dissected by the ancient Koa Valley, a Miocene relic with remnants of Cenozoic fluvial deposits that has produced fossil vertebrate bone as well as fossil wood. Southwards, the Koa Valley joins an extensive system of pans fossil where several Palaeogene and Neogene vertebrate fossil remains have been identified. No fossils have been explicitly reported from the terraces between Douglas and Prieska yet, but a variety of fossil fauna have been retrieved from gravel terraces along the Lower Vaal River basin. Here, gravel terraces between 21m and 30m above present river level, contain frequent sandy lenses and have yielded vertebrate fauna such as the extinct proboscidian, *Mammuthus subplanifrons* that are estimated to be ranging in age from 4.5 to 3.5 million years old. Other fossil remains include extinct suids and more proboscidian taxa, notably *Notochoerus capensis*, and *Elephas iolensis*.

Impact Statement Recommendation

The desktop investigation indicates that the development footprint is underlain by glacially related Dwyka Group sediments considered to be of low palaeontological sensitivity, that are capped by late Tertiary surface limestones (*T-Qc*) and Quaternary aeolian sands (*Qs*). The surface limestones and geologically recent aeolian sand overburden in the region is generally not considered to be fossiliferous in the absence of pans, springs and well-developed alluvial deposits. As far as the palaeontological heritage is concerned, exploration activities may proceed provided that investigation of the well-developed Quaternary overbank (alluvial) deposits flanking the banks of the Orange River (**Fig. 3**, white line) are accompanied by a phase 1 palaeontological site assessment during the actual exploration phase of the project. In the event of fossil discovery within the Quaternary overburden (i.e. modern-looking but more or less lithified animal bones and teeth), elsewhere during the exploration phase of the development, a professional palaeontologist must be called in immediately to confirm and record the finds. 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.

References

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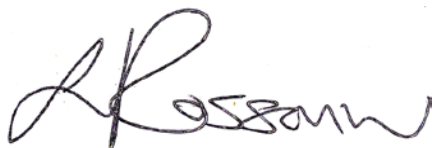
Beukes, N.J. 1979. Litostratigrafiese onderverdeling van die Schmidtsdrif-Subgroep van die Ghaap Groep in Noord Kaapland. *Transactions of the Royal Society of South Africa* 82: 313 – 327.

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Von Brunn, V. & Visser, J.N.J. 1999. Lithostratigraphy of the Mbizane Formation (Dwyka group). *South African Committee for Stratigraphy, Lithostratigraphic Series No. 32*, 10 pp. Council for Geoscience, Pretoria.

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 and have no conflicting interests in the undertaking of the activity.



28 / 06 / 2017

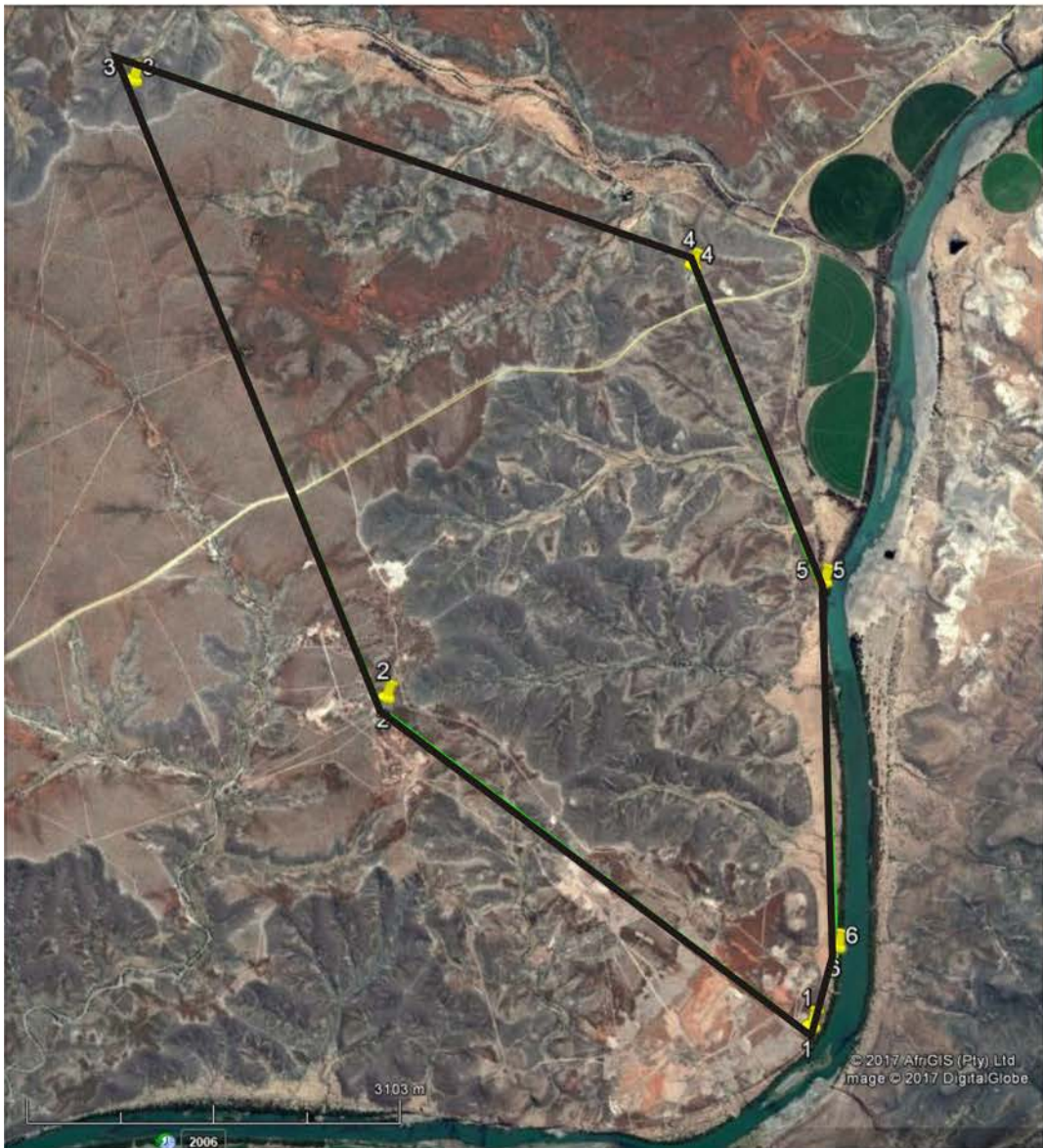


Figure 1. Aerial view and position of study area in relation to Douglas.

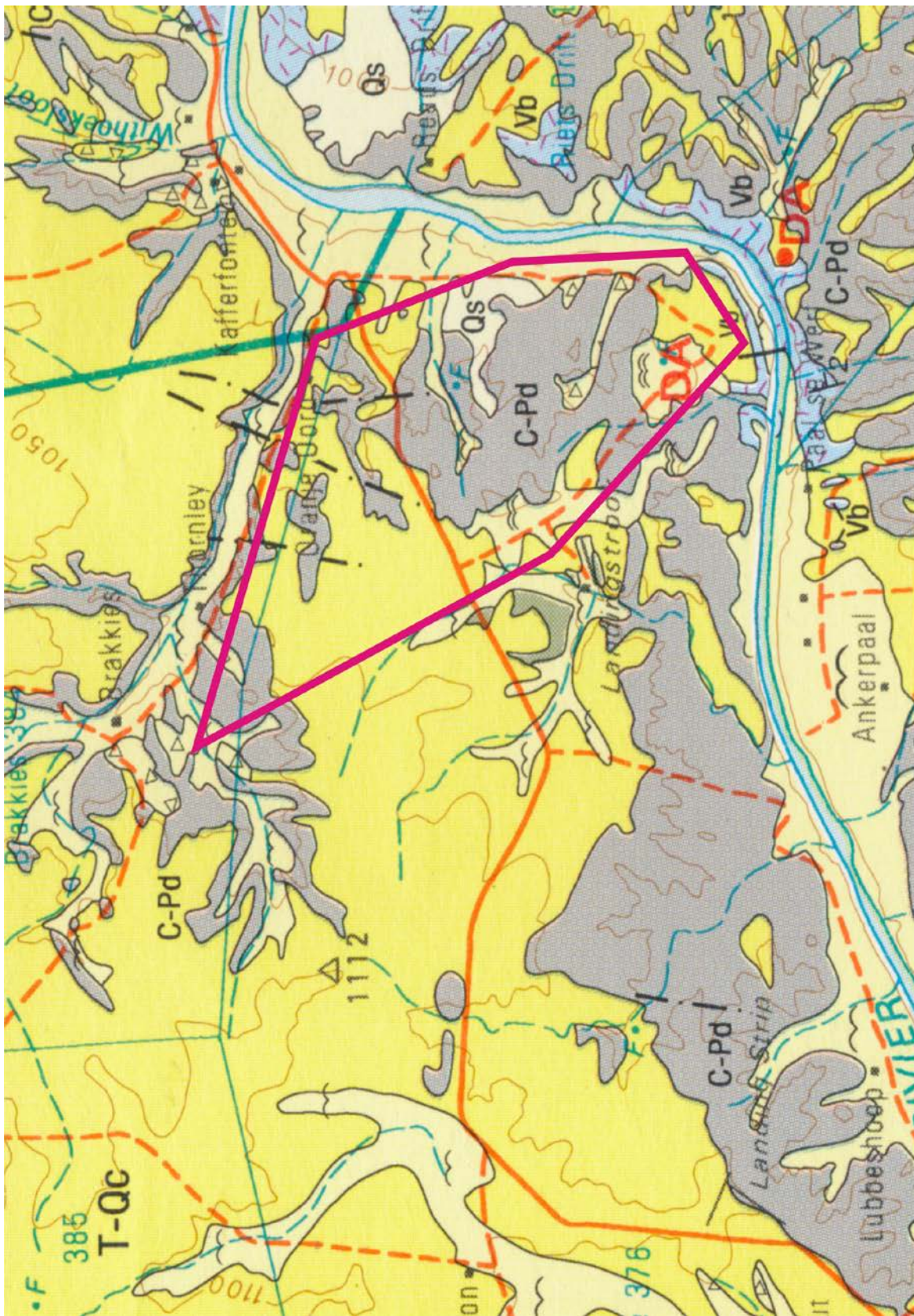


Figure 2. Study area marked on portion of 1:250 000 scale geological map 2922 Prieska.



Footprint

Stromatolites
Boomplaas Frm.

Quaternary
overbank
deposits

Figure 3. Potentially sensitive areas.