

**Palaeontological Desktop Assessment of the farm
Doorn Knie 193 RE near Kenhardt, Northern Cape
Province.**

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Summary

The proposed development footprint is underlain by glacially related Dwyka Group sediments considered to be of low to moderate palaeontological sensitivity. It is capped by superficial deposits of moderate to high palaeontological sensitivity where unweathered gravelly alluvial deposits and pan sediments occur. For that reason water courses, depression margins and pan dune deposits are considered to be palaeontologically sensitive and it is advised that, if possible, a Phase 1 Palaeontological Impact Assessment is conducted after individual exploration localities have been tentatively identified, but before the start of invasive prospecting (core drilling, trenching and pitting) so that potential palaeontological sites can be identified, recorded and avoided.

Introduction

The report is a preliminary assessment of potential palaeontological impact with regard to planned mining exploration and prospecting activities on the farm Doorn Knie 193, situated within the Siyanda District Municipality, about 60 km due south of the N14 national road between Upington and Springbok and about 70 km due west of Kenhardt in the Northern Cape Province (**Fig. 1**). The assessment is required as a prerequisite for new development in terms of the National Heritage Resources Act 25 of 1999. The Act identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories of development relevant to the proposed development are listed in Section 34 (1), Section 35 (4), Section 36 (3) and Section 38 (1) of the Act, which also include the protection of geological and paleontological sites as well as palaeontological objects and material, meteorites and rare geological specimens. According to the SAHRIS Palaeo Sensitivity Map of South Africa (2016), the proposed development footprint is located within an area considered to be of moderate palaeontological sensitivity and for that reason requires a palaeontological desktop assessment

Methodology

Geological maps were used to pin point fossil-bearing rocks within the study area. The palaeontological significance of the affected area is evaluated using existing field data, database information and published literature. Potential impact on

palaeontological heritage resources was determined by the scale of the proposed development and the palaeontological sensitivity of the relevant rock units that may be affected.

Locality data

1:50 000 scale topographic map: 2920AD Doringknie and 2920CB Boomrivier

Site coordinates (**Fig. 2**):

- A) 29°19'27.38"S 20°21'30.05"E
- B) 29°17'17.30"S 20°26'25.20"E
- C) 29°26'19.40"S 20°28'33.31"E
- D) 29°28'44.11"S 20°25'32.94"E

Background

According to the 1:250 000 scale geological map 2920 Kenhardt, the study area is underlain by glacially derived sediments of the Permo-Carboniferous Mbizane Formation (Karoo Supergroup, *C-Pd*), intruded by early Jurassic dolerite intrusions (Karoo Dolerite Suite) to the north (Slabbert *et al.* 1999) (**Fig. 3**). The glacially-related sediments of the Mbizane Formation is regarded as a heterolithic unit recognized in the upper part of the Dwyka Group and 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 (Von Brunn & Visser 1999). 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 sediments are made of downwasted bedrock sediments, Kalahari Group pedocretes and aeolian sand, as well as remnants of Tertiary and Quaternary (Miocene to Pleistocene) fluvial systems related to infill deposits (drainage depressions) of the Carnarvon Leegte and associated gravel terraces of the palaeo- Sak River which was once part of the ancient Koa Valley, situated about 140 km due west of the study area (De Wit *et al.* 2000) (**Fig. 4**). Fossils associated with these Late Cenozoic drainage systems include mammals, reptiles, fish, molluscs, petrified wood and ichnofossils (De Wit *et al.* 2000; De Wit 1999; De Wit and Bamford 1993). Anthracothere and fossil wood remains,

suggesting subtropical environments during the Lower to Middle Miocene, have been recovered from basal alluvial gravels in the Geelvloer Palaeovalley near Brandvlei located 120 km due south of the study area, where it links up with the Koa Valley palaeodrainage system through Commissioners Pan (**Fig. 5**). Several mammal types including Miocene Gomphothere tooth fragments, a giraffid ossicone, bovid, rhinocerotid and tortoise remains as well as crocodile teeth fragments have been recovered from gravels at Bosluispan in the upper reaches of the Koa Valley. Younger sediments associated with Plio-Pleistocene drainage systems (alluvium, pan sediments) in the region may also occasionally yield vertebrate fossil remains. Mammalian teeth and bones of mainly grazers have been recovered from basal gravels in the Carnavon Leegte while Late Pleistocene faunal remains associated with Stone Age artefacts have been recovered from pan sediments at Bundu Farm near Copperton (De Wit 1999; Kiberd 2006).

Impact Statement

The desktop investigation indicates that the study area is underlain by glacially related Dwyka Group sediments considered to be of low to moderate palaeontological sensitivity. It is capped by superficial deposits considered to be of moderate to high palaeontological sensitivity where unweathered gravelly alluvial deposits and pan sediments occur. For that reason water courses, depression margins and pan dune deposits are considered to be palaeontologically sensitive (**Fig. 6**) and it is advised that, if possible, a Phase 1 Palaeontological Impact Assessment is conducted after individual exploration localities have been tentatively identified, but before the start of invasive prospecting (core drilling, trenching and pitting) so that potential palaeontological sites can be identified, recorded and avoided.

References

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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.

A handwritten signature in black ink, appearing to read 'L Rossouw', with a stylized, cursive script.

15 / 03 / 2017

Figures

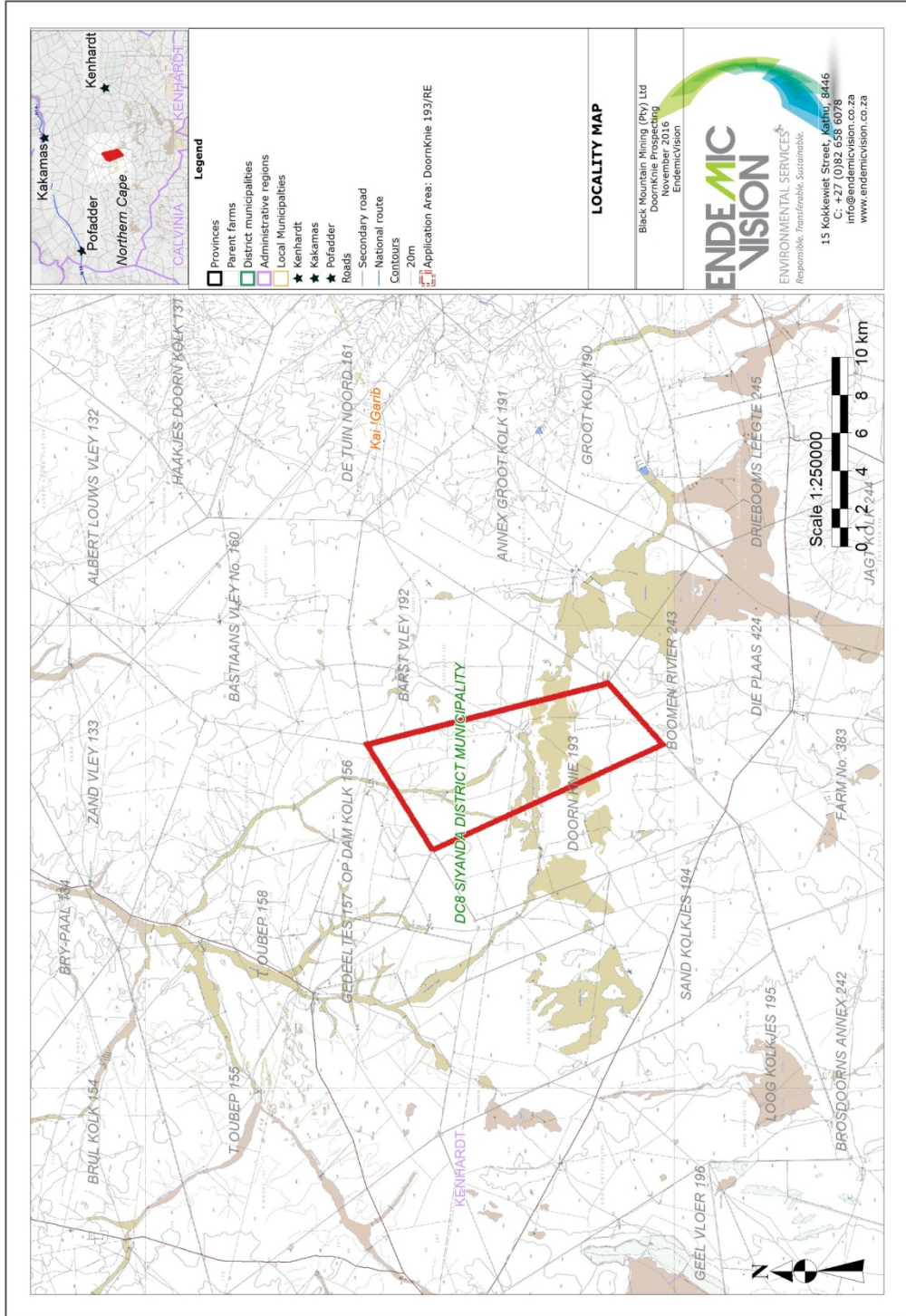


Figure 1. Map of the proposed study area on portion of 2920 Kenhardt.

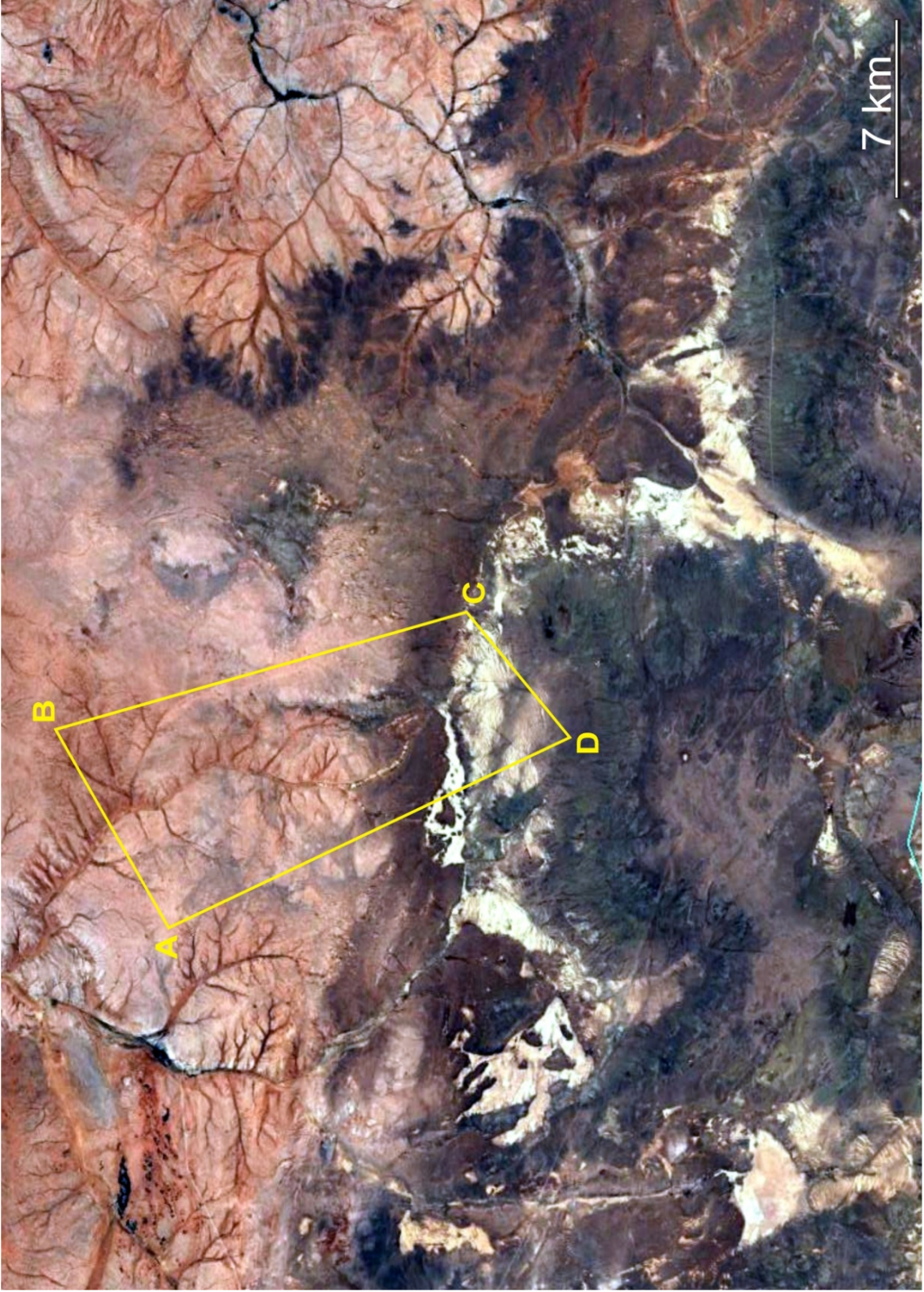


Figure 2. Aerial view of the study area.

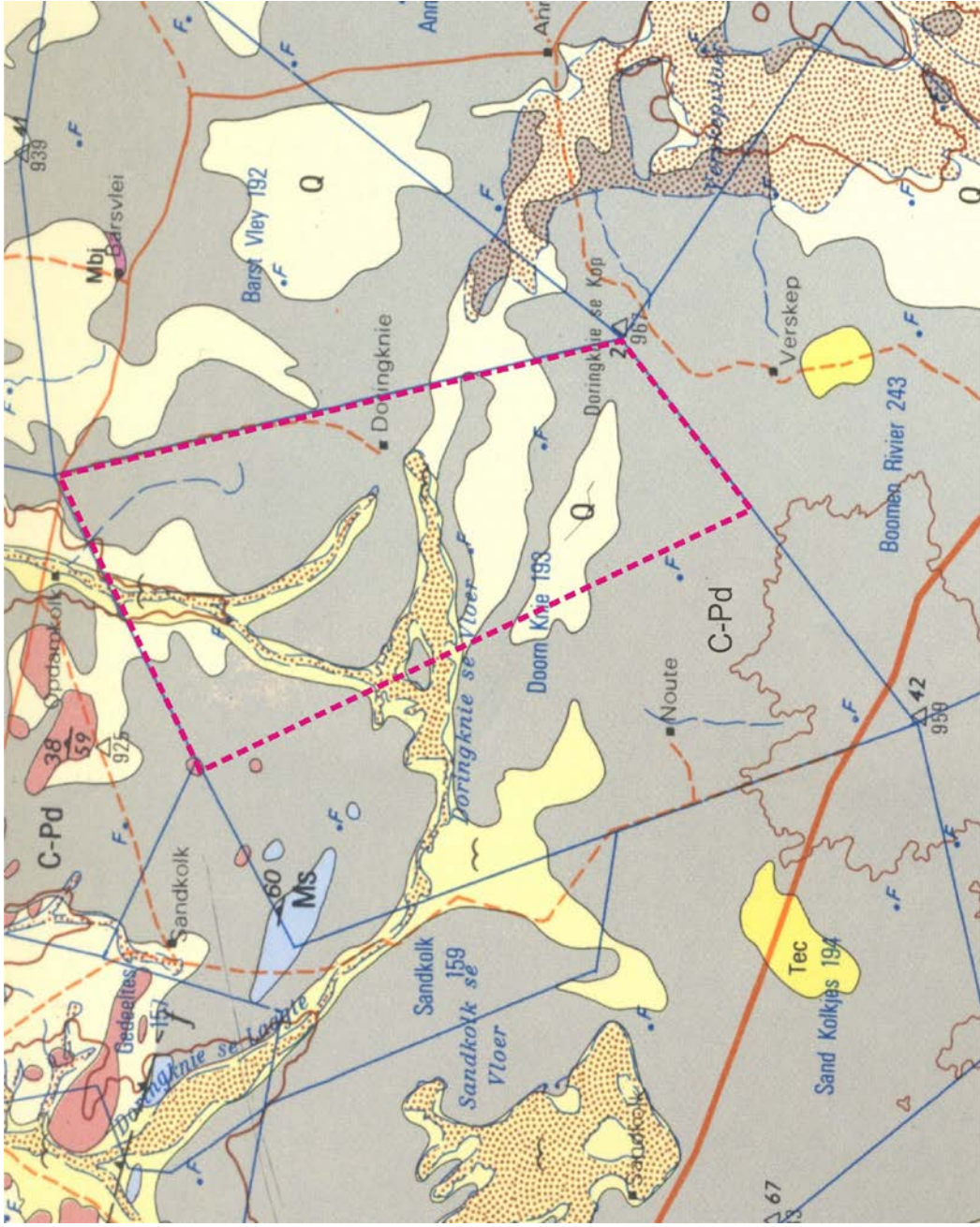


Figure 3. Portion of 1:250 000 scale geological map 2920 Kenhardt, showing that the study area is underlain by glacially derived sediments of the Permo-Carboniferous Mbizane Formation (Karoo Supergroup, C-Pd), intruded by early Jurassic dolerite intrusions to the north (Jd). Superficial sediments are made of downwasted bedrock sediments, Kalahari Group pedocretes and aeolian sand (Q), as well as remnants of Tertiary and Quaternary (Miocene to Pleistocene) fluvial systems related to infill deposits (drainage depressions) of the Camarvon Leegete and associated gravel terraces of the palaeo-Sak River (not shown on map).

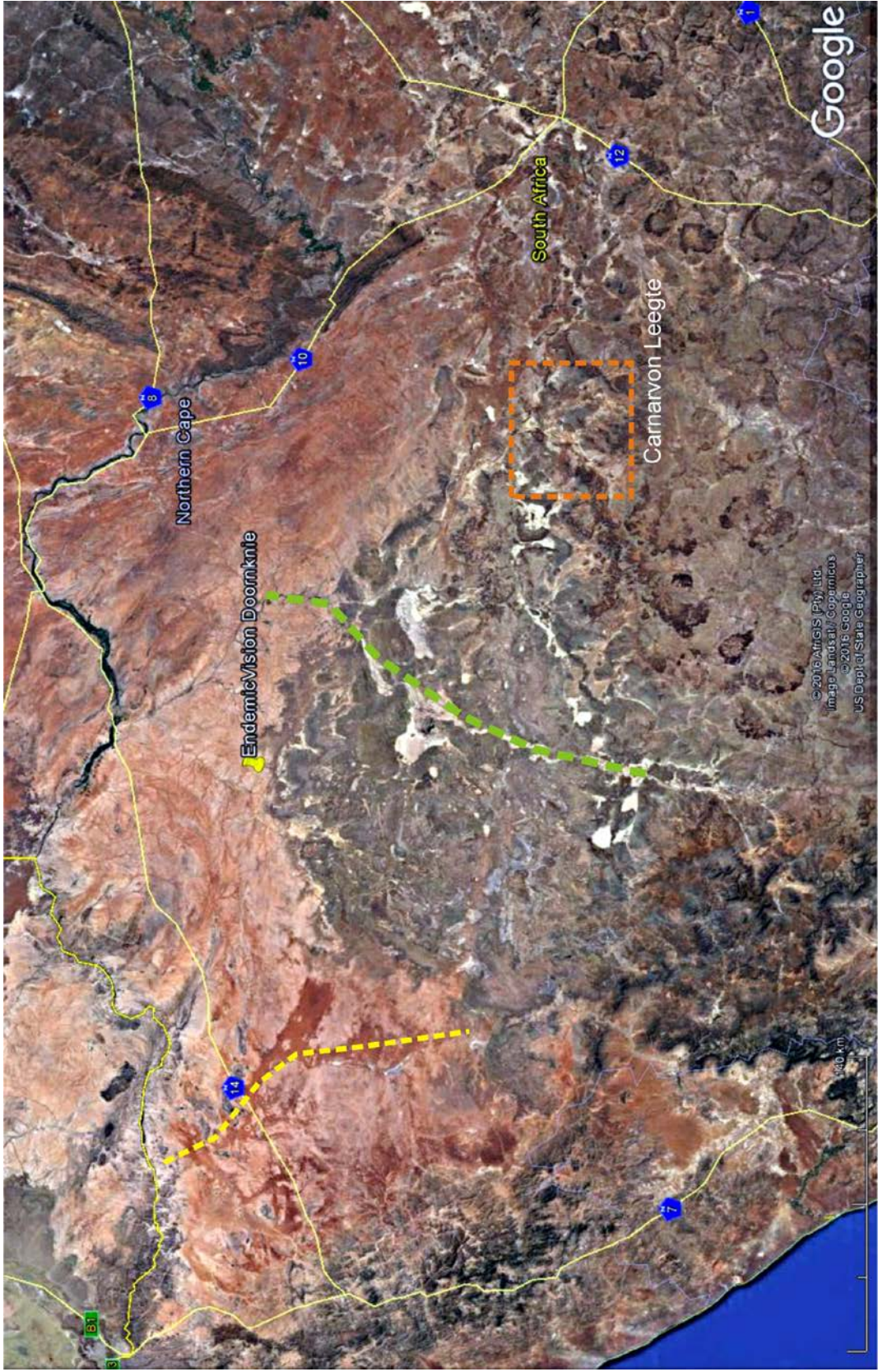


Figure 4. Tertiary Sak River and Koa Valley fluvial systems (green and yellow line, respectively).

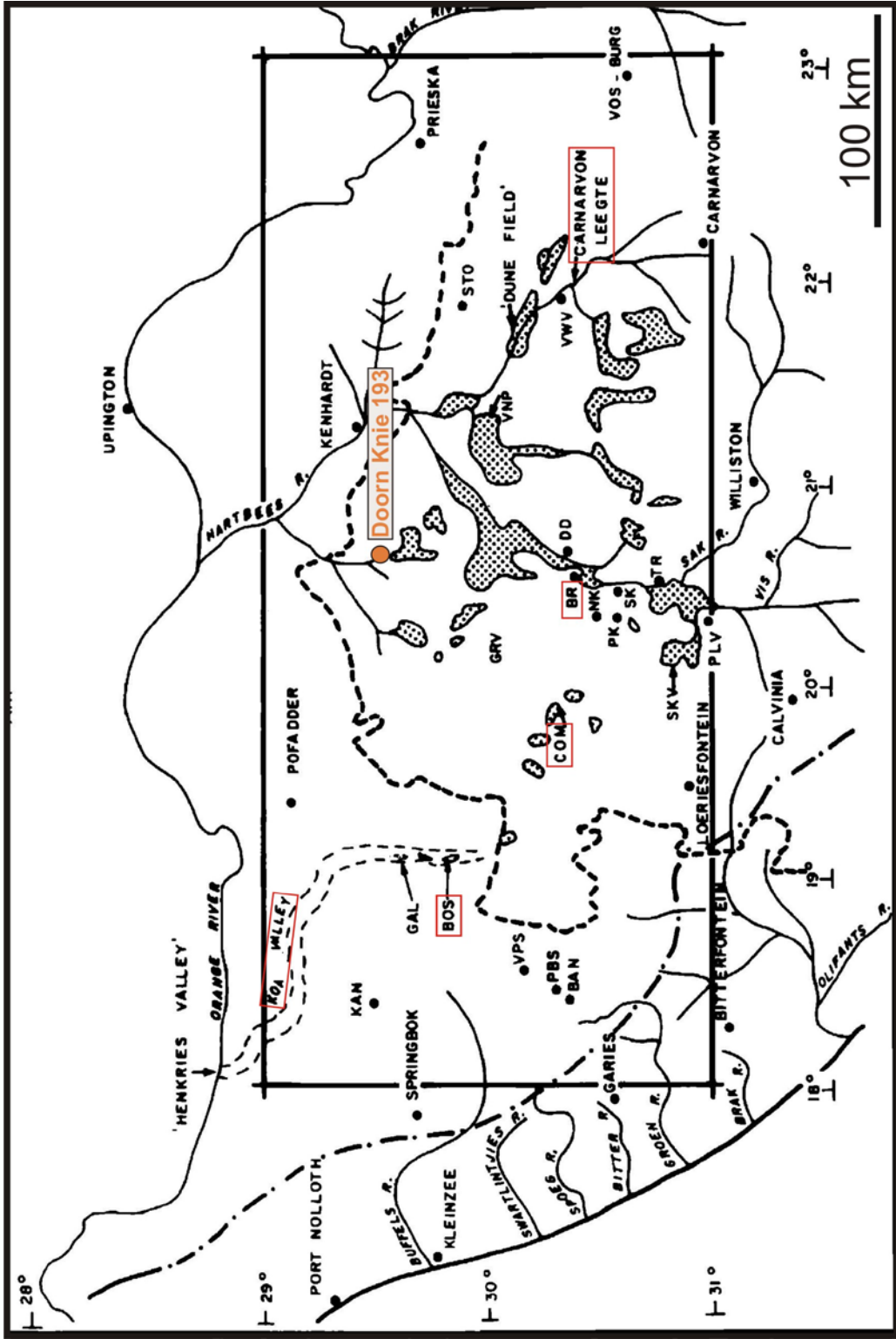


Figure 5. Sites and localities associated with potentially fossil-bearing Tertiary fluvial sediments, BR = Brandvlei, COM = Commissioners Pan; BOS = Commissioners Pan; VOS = Vos-Burg (after De Wit 1999).



Figure 6. Potentially sensitive areas marked by yellow lines include water courses, linear depressions and well-developed pan dune deposits.