

Phase 1 Palaeontological and Archaeological Impact
Assessment of the proposed Phokeng Township
extension at Thabong, Matjhabeng Local Municipality,
Free State Province.



Report prepared for Phethogo Consulting Bloemfontein by Paleo Field Services,
PO Box 38806 Langenhovenpark 9330

Executive Summary

- A Phase 1 Heritage Impact Assessment was carried in Thabong where anticipated development calls for the development of 1005 erven for the proposed Phokeng Township extension.
- The site is situated near and within a densely populated residential area where the landscape has been severely disturbed by suburban development and prior building activities.
- There is no evidence of intact or capped Stone Age archaeological material or Quaternary fossil remains within the confines of the affected areas.
- There are no indications of prehistoric structures or rock engravings within the affected areas.
- There is also no evidence of graves, graveyards or historical structures within the confines of the affected areas.
- It is also unlikely that the proposed development will significantly impact on potentially fossil-bearing bedrock. However, in the event where deep trench excavations could affect underlying sedimentary bedrock sediments, it is advised that newly uncovered objects of palaeontological significance must be reported to the relevant heritage authorities (SAHRA or FSPHRA).
- There are no major archaeological or palaeontological grounds to suspend the proposed development.
- Recommended Grading: General Protection C (Field Rating IV C).

Contents

Executive Summary	2
Introduction.....	4
Methodology	4
Description of the Affected Area	4
Locality data.....	4
Geology	4
Background	5
Karoo Fossils	5
Late Cenozoic Deposits	5
Results of Survey	6
Impact Statement	6
Recommendation	7
References	7
List of Tables and Figures.....	9

Introduction

At the request of Phethogo Consulting in Bloemfontein, a Phase 1 Heritage Impact Assessment was carried out at a 84 ha site demarcated for the development of 1005 erven for the proposed Phokeng Township extension in Thabong in the Free State Province (**Fig. 1**) The extent of the proposed development (over 5000 m²) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act (Act No. 25 of 1999). The site visit and subsequent assessment took place during October 2013. The task involved identification of possible archaeological and paleontological sites or occurrences in the proposed zone, an assessment of their significance, possible impact by the proposed development and recommendations for mitigation where relevant.

Methodology

The assessment consists of a desktop study as well as pedestrian survey of the site. The desktop study provides an assessment of known and potential palaeontological and archaeological heritage within the study area, with recommendations for mitigation where considered necessary. The assessment is based on existing field data and published scientific literature. The geology represented within the study area was determined from published literature and associated geological maps. Relevant archaeological and palaeontological information were assimilated for the report and integrated with data acquired during the on-site inspection.

Description of the Affected Area

Locality data

1:50 000 scale topographical map 2726 DD Riebeeckstad

1:250 000 scale geological map 2726 Kroonstad

The affected area is situated in Thabong north of Bronville between the R73 and R70 national roads. It is made up of 84 ha of open, disturbed grassland situated next to a low-lying drainage line within the residential area of Thabong (**Table 1, Fig. 2 & 3**).

Geology

From oldest to youngest, the geology in and around the affected area is made up of Permian Ecca shales (Volksrust Formation, *Pvo*), late Permian sandstones and

mudstone layers of the Adelaide Subgroup (*Pa*, Beaufort Group), Jurassic dolerite intrusions (*Jd*, Karoo Dolerite Suite), Quaternary calcretes, surface limestones, calcified pandunes (*Qc*) and aeolian sands (*Qs*). Outcrops of Volksrust Formation shales, Adelaide Subgroup rocks are indicated to the east and south of the affected area. The site is capped by Quaternary-age surface deposits and residual soils (**Fig. 4**).

Background

Karoo Fossils

Although there are no records of fossil occurrences from the Volksrust Formation in the vicinity of the study area, the formation is characterized by the presence of plant fossils, with six genera, representing the glossopterids and possibly other seed fern groups (Bamford 2003). A pelecypod bivalve have been described from the distal sediments of a prograding delta, at the Beaufort Group–Ecca Group boundary (Cairncross *et al.* 2005) and beetles (Coleoptera) have been recorded from the formation in Kwazulu-Natal (Ponomarenko & Mostovski 2005). Reptile fossils are absent from the formation. The Volksrust Formation is generally considered to be of low palaeontological sensitivity.

As part of the fossil-rich Beaufort Group strata, the overlying Adelaide Subgroup rocks (*Pa*) in the region are assigned to a biostratigraphic biozone called the *Dicynodon* Assemblage Zone (**Fig. 5**). This biozone outcrops continuously around the Karoo Basin and is characterized by a varied and abundant therapsid fauna, including the presence of both *Dicynodon* and *Theriongnathus*. Therapsids from this biozone are generally well-preserved in mudrock horizons and are usually found as dispersed and isolated specimens associated with an abundance of calcareous nodules. Other vertebrate fossils include fish, amphibians and amniotes. Molluscs, insects, plant (*Dadoxylon*, *Glossopteris*) Trace fossils (arthropod trails, worm burrows) have also been recorded in this biozone.

Late Cenozoic Deposits

Exploratory surveys along fluvially derived overbank sediments of the Sand, Doring and Vet Rivers and their tributaries to the south of Thabong, indicate that these river systems contain fossil remains of a variety of extinct mammals. In addition, the alluvial sediments are also valuable sources of open-site Stone Age archaeological

assemblages. The Stone Age archaeological footprint in the region is largely represented by the occurrence of open-site, Middle Stone Age (MSA) and Later Stone Age (LSA) assemblages that are occasionally discovered, in association with mammal fossil remains, in a series of erosional gullies along the Sand, Doring and Vet Rivers between Virginia and Theunisen (**Fig. 6 no. 1 – 5**).

Ancient pan sites in the region, such as the one at Whites near Hennenman, have equally produced abundant Quaternary-aged mammal fossil remains (**Fig. 6 no. 6**). The discovery of *in situ* proboscidian fossil material, consisting of a lower molar, the proximal half of an ulna and a large part of a tusk from fluvial sediments over 40 meters, above the riverbed of the Sand River near Virginia, has highlighted the potential antiquity of the gravel terraces flanking the modern Sand River (**Fig. 6 no. 7**). The fossiliferous fluvial deposits are tentatively dated to the Pliocene based on the occurrence of specimens included in this taxon, in beds of early to middle Pliocene age from the Vaal River terraces and at Langebaanweg.

There are no records of rock engravings in the vicinity of the survey area. The survey area is situated at the western periphery of distribution of Late Iron Age settlements in the Free State. Ruins of Late Iron Age settlements are found on several farms to the east, such as the large settlement complex at Strydfontein (OXF 1, Maggs 1976) between Hennenman and Ventersburg (**Fig. 6 no. 8**).

Results of Survey

There is no outcrop of potentially fossil-bearing bedrock (Adelaide Subgroup) visible at the site. It is primarily underlain by Quaternary-age surface deposits and residual soils (topsoils) covered by open grassland (**Fig. 7**). The terrain has been severely disturbed by informal settlement with numerous informal dwellings, cattle kraals and pig pens located on site (**Fig. 8**). There is no evidence of intact or capped Stone Age or Iron Age archaeological material or Quaternary fossils within the confines of the footprint. There are no indications of prehistoric structures or rock engravings within the footprint area. There is also no evidence of graves, graveyards or historical structures older than 60 years within the confines of the footprint.

Impact Statement

Potential impacts are summarized in **Table 2**. Impact on Quaternary sediments (unconsolidated topsoils) within the footprint will be extensive, but impact on

potentially intact Stone Age archaeological remains, Iron Age structures or Quaternary fossils is considered unlikely. It is also unlikely that the proposed development will significantly impact on potentially fossil-bearing bedrock. Nevertheless, it is noted that deep trench excavations could potentially affect underlying sedimentary bedrock sediments.

Recommended Grading: General Protection C (Field Rating IV C).

Recommendation

There are no major archaeological or palaeontological grounds to suspend the proposed development. In the event where deep trench excavations could affect underlying sedimentary bedrock sediments, it is advised that newly uncovered objects of palaeontological significance must be reported to the relevant heritage authorities (SAHRA or FSPHRA).

Recommended Grading: General Protection C (Field Rating IV C).

References

- Bamford, M. 2003 Diversity of the Woody Vegetation of Gondwanan Southern Africa. *Gondwana Research* 7(1): 153 – 164.
- Cairncross *et al.* 2005. The Bivalve *Megadesmus* from the Permian Volksrust Shale Formation (Karoo Supergroup), northeastern Karoo Basin, South Africa. *South African Journal of Geology* 108 (4) 547-556
- Johnson *et al.* 2006. Sedimentary rocks of the Karoo Supergroup. **In:** M.R. Johnson, *et. al.* (eds). *The Geology of South Africa*. Geological Society of South Africa.
- Kithcing, J.W. 1995. Biostratigraphy of the *Dicynodon* Assemblage Zone IN B.S. Rubidge (ed.) *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 1, 29 – 34.
- Maggs T. M. O'C 1976. *Iron Age Communities of the Southern Highveld*. Occasional Publications of the Natal Museum No. 2. Natal Museum, Pietermaritzburg.
- Partridge, T.C. *et al.* 2006. Cenozoic deposits of the interior. **In:** M.R. Johnson, *et. al.* (eds). *The Geology of South Africa*. Geological Society of South Africa.
- Ponomarenko, A.G. & Mostovski, M.B. 2005. New beetles (Insecta: Coleoptera) from the Late Permian of South Africa. *African Invertebrates* 46. The Council of Natal Museum.

- Schutte, I.C. 1994. Geologie van die gebied Kroonstad. Explanation to 1: 250 000 scale geological sheet 2726 Kroonstad, 84 pp. Council for Geoscience, Pretoria.
- Rubidge, B. S. 1995. (ed.) *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 1, 1 – 45.

List of Tables and Figures

Table 1. General coordinates of the area surveyed.

Loc.	Coordinates
NW corner	27°56'56.73"S 26°48'49.85"E
NE corner	27°56'45.67"S 26°49'20.03"E
SE corner	27°56'49.36"S 26°49'37.94"E
SW corner	27°57'18.65"S 26°49'8.53"E

Table 2. Summary of potential impacts at the site.

Rock type / Age	Duration of Development	Overall Palaeontological significance	Overall Archaeological significance	Palaeontological Impact at site	Archaeological Impact at site
Aeolian sands, Alluvium, Residual soils (Quaternary)	Permanent	High	Moderate - High	Low	Low
Dolerite Suite, <i>Jd</i> (Jurassic)	Permanent	None	Low - Moderate (Stone Age quarries)	None	None
Mudstone, Sandstone; Adelaide Subgroup, <i>Pa</i> (Permian)	Permanent	Moderate - High	None	Low	Low
Shale, siltstone, Sandstone / Eccu Group, <i>Pvo</i> (Permian)	Permanent	Low	None	Low	Low

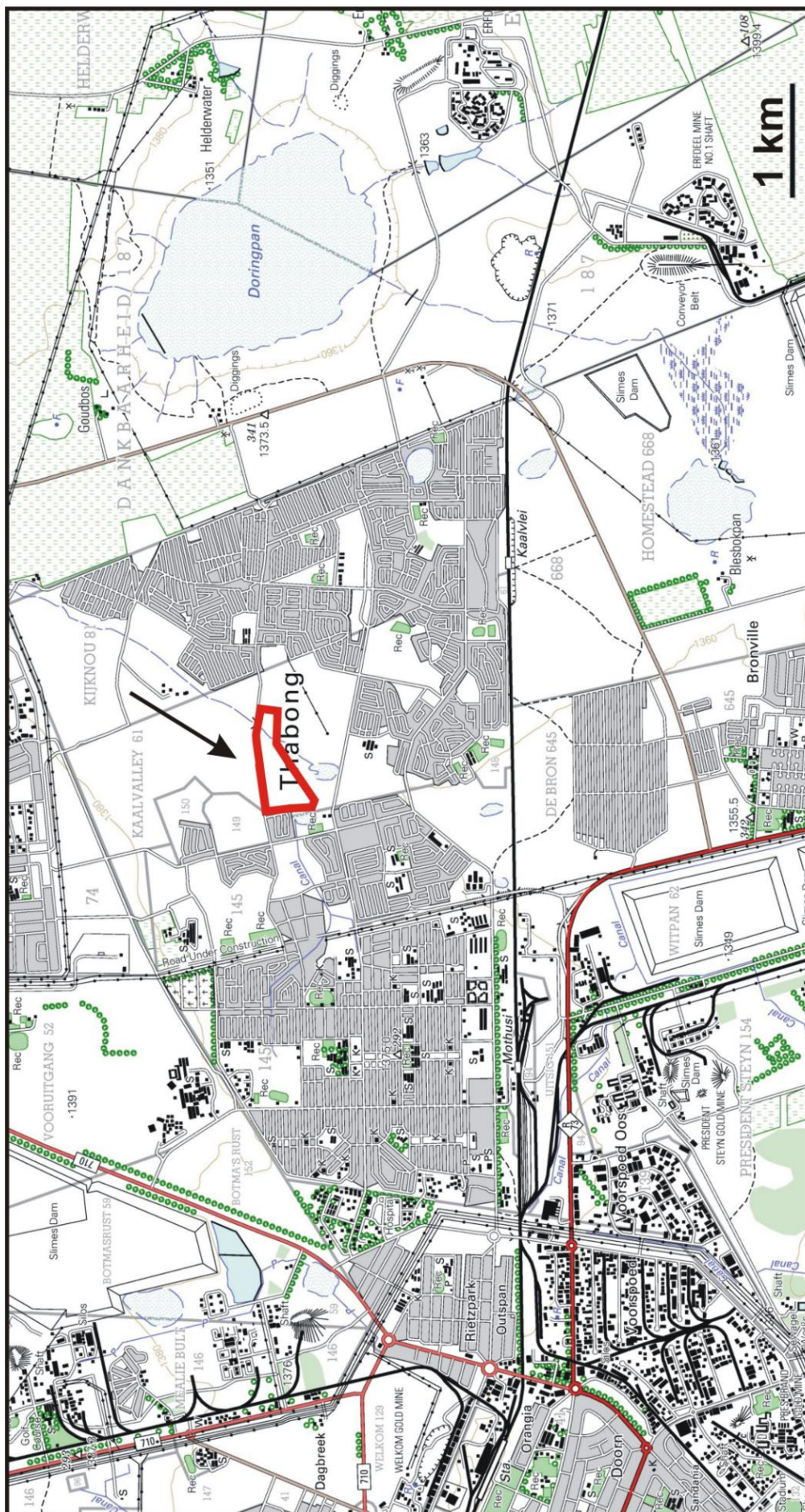


Figure 1. Locality of the proposed Phokeng Township extension (portion of 1:50 000 scale topographic map 2726 DD Riebeeckstad).



Figure 2. Aerial view of the study area.



Figure 3 . Panoramic view of the study area looking west southwest (above). The site consists of 84 ha of open, disturbed grassland situated within a residential area next to a perennial drainage line (below).

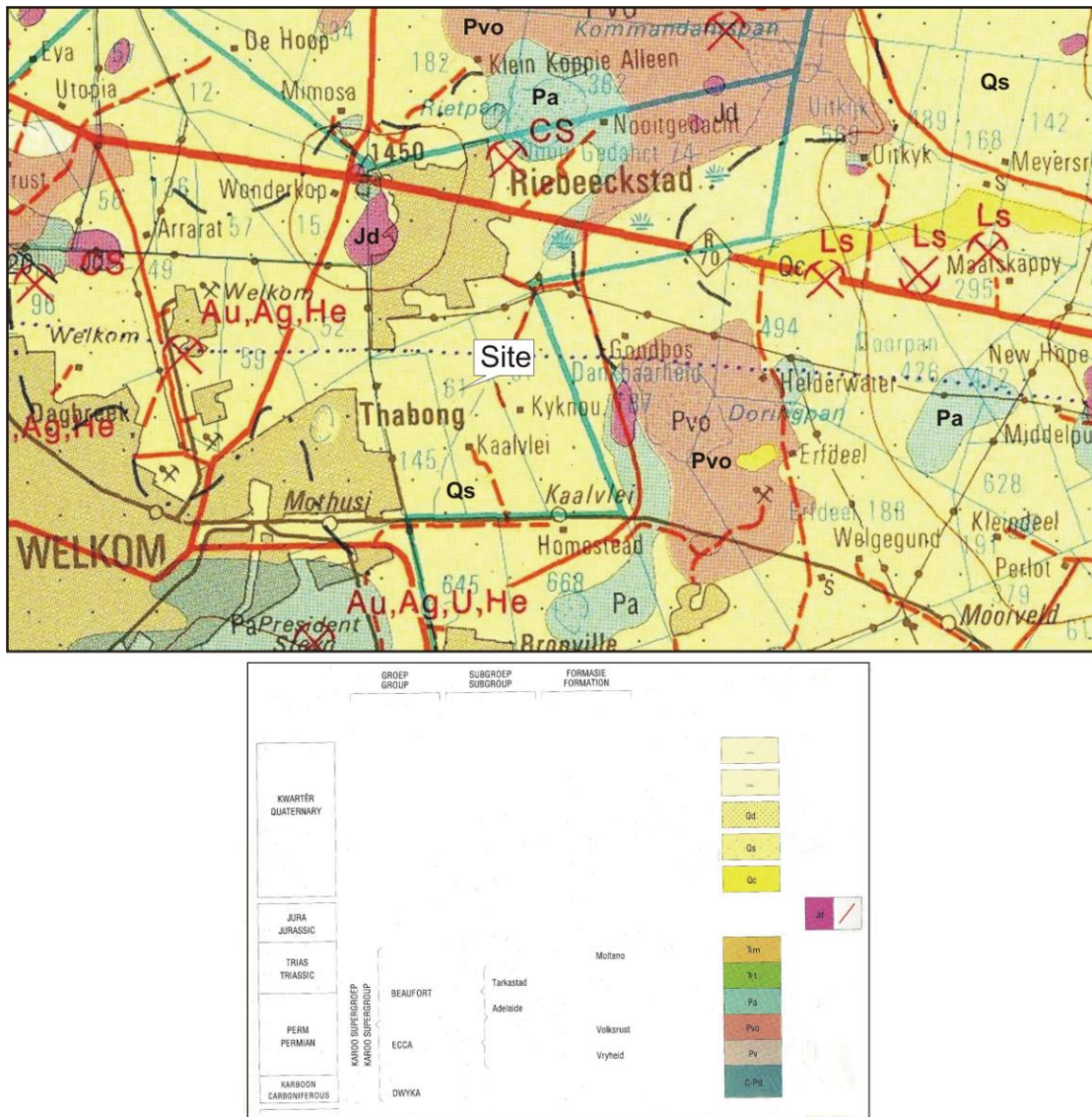


Figure 4. Portion of 1:250 000 scale geological map 2726 Kroonstad. From oldest to youngest, the geology in and around the affected area is made up of Permian Eccla shales (Volksrust Formation, Pvo), late Permian sandstones and mudstone layers of the Adelaide Subgroup (Pa, Beaufort Group) Jurassic dolerite intrusions (Jd, Karoo Dolerite Suite), Quaternary calcretes, surface limestones, calcified pandunes (Qc) and aeolian sands (Qs).

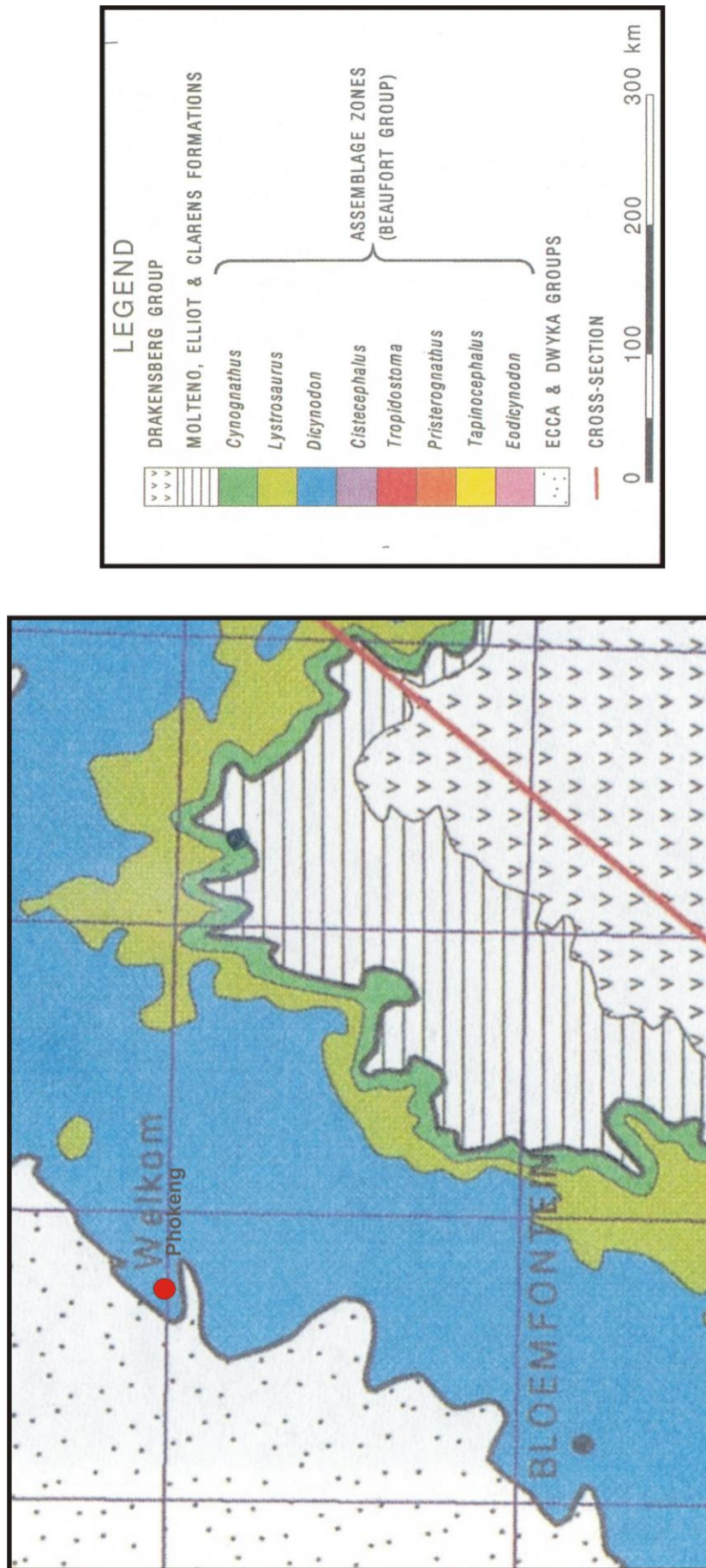


Figure 5. Geographical distribution of vertebrate biozones of the Beaufort Group around Phokeng (after Rubidge 1995).

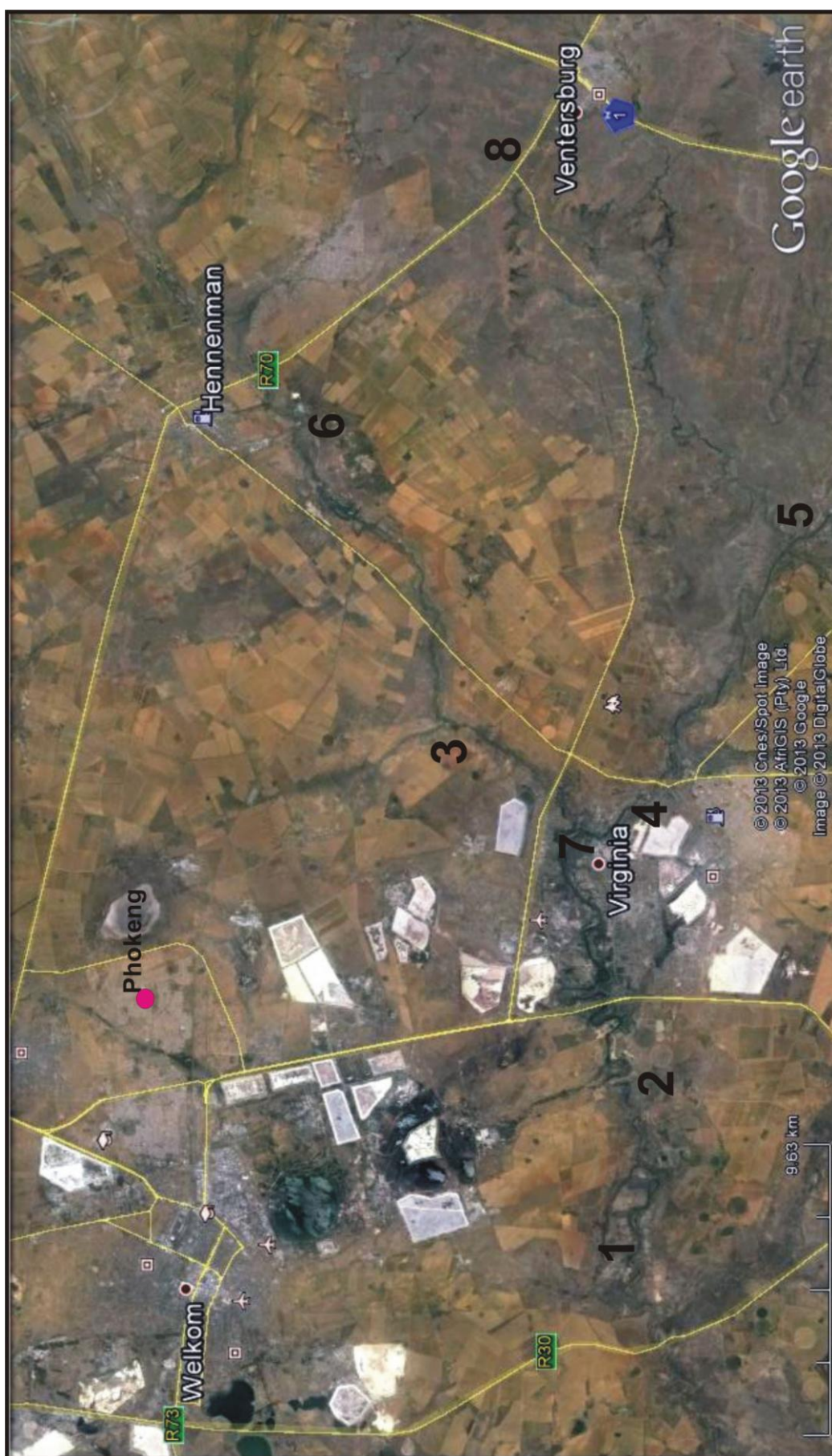


Figure 6. Map of known palaeontological and archaeological sites in the area.



Figure 7. The site is underlain by Quaternary-age aeolian surface deposits (left) and residual soils (center), covered by open grassland.

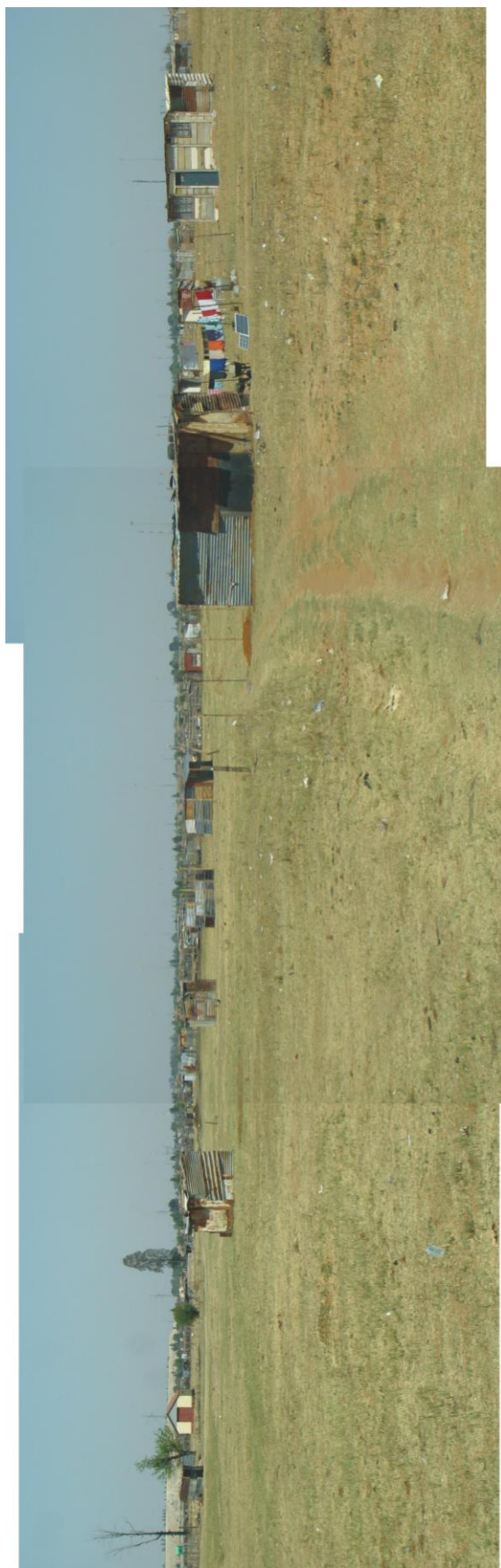


Figure 8. The terrain has been severely disturbed by informal settlement with numerous informal dwellings (above) cattle kraals and pig pens (left) located on site.