

Phase 1 Palaeontological and Archaeological Impact
Assessment of a proposed township extension at
Cornelia, Free State Province.



Report prepared for:
NSVT Environmental Consultants

by

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Contents

Executive Summary	3
Introduction.....	4
Methodology	4
Description of the Affected Area	4
Details of development and the area surveyed.....	4
Geology.....	5
Background.....	5
Karoo Fossils	5
Karoo Dolerites.....	5
Late Cenozoic Deposits	5
Archaeology.....	6
Field Assessment	6
Impact Statement	7
Recommendation	7
References.....	7
Tables & Figures.....	8

Executive Summary

- At the request of NSVT Environmental Consultants in Bloemfontein, a Phase 1 Palaeontological and Archaeological Impact Assessment was carried out at an approximately 40 ha site demarcated for township development at Cornelia in the Free State Province.
- The field assessment indicates that the proposed development will primarily impact on Quaternary-age surface deposits and dolerite bedrock.
- Normandien Formation sedimentary rocks in the area may contain fossils, but the chances of finding fossils are very low.
- There is no evidence of intact or capped Stone Age artefacts, Iron Age structures or Quaternary fossils within the confines of the footprint. There are no indications of prehistoric structures or rock art within the footprint area. There is also no evidence of informal graves or historical structures older than 60 years within the confines of the footprint.
- The terrain is not considered palaeontologically or archaeologically vulnerable.
- There are **no major archaeological or palaeontological grounds** to suspend the proposed development.
- Recommended Grading: General Protection C (Field Rating IV C)

Introduction

At the request of NSVT Environmental Consultants in Bloemfontein, a Phase 1 Palaeontological and Archaeological Impact Assessment was carried out at an approximately 40 ha site demarcated for township development at Cornelia in the Free State Province (**Figs. 1 & 2**) 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 in November 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 palaeontological and archaeological significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information, published literature and maps. This was followed up 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.

Description of the Affected Area

Details of development and the area surveyed

Details of area surveyed

Maps: 1:50 000 topographical map 2728BA Villiers

1:250 000 geological map 2728 Frankfort

General Site Coordinates (**Fig. 3**):

- A) 27°14'20.74"S 28°50'39.01"E
- B) 27°14'19.80"S 28°50'51.15"E
- C) 27°14'29.46"S 28°51'2.24"E
- D) 27°14'52.18"S 28°50'49.38"E
- E) 27°14'29.54"S 28°50'30.47"E

The affected area is made up of approximately 40 ha of moderately disturbed, open grassland situated on the south-eastern outskirts of Cornelia (**Fig. 4**).

Geology

From oldest to youngest, the geology around Cornelia is made up of Ecca Group shales (Volksrust Formation, *Pvo*), Beaufort Group sandstones and mudstones (Normandien Formation, *Pne*), Jurassic dolerite intrusions (*Jd*, Karoo Dolerite Suite), and superficial sediments of Quaternary age (Muntingh 1989). The superficial deposits are made up of alluvium (Cornelia Formation) and recent residual soils (**Fig. 5**). The study area itself is mantled by geologically recent residual soils (topsoils), underlain by sedimentary rocks (Normandien Formation) that are for the most part intruded by Jurassic dolerites (**Fig.6**).

Background

Karoo Fossils

Biostratigraphically, rocks belonging to the Normandien Formation are assigned to the Dicynodon Assemblage Zone. The Assemblage Zone (AZ) is characterized by the presence of a variety of therapsid fauna, including both *Dicynodon* and *Theriognathus* (Kitching 1995). According to Groenwald (1990), three fossil species, namely *Dicynodon lacerticeps*, *Theriognathus platyceps* and *Prorubidgea maccabei*, are present in the Schoondraai Member of the Normandien Formation, while *Lystrosaurus murrayi* sans *Dicynodon lacerticeps* is present in the overlying Harrismith Member.

Karoo Dolerites

Dolerite (*Jd*), in the form of dykes and sills are not palaeontologically significant and can be excluded from further consideration in the present palaeontological evaluation.

Late Cenozoic Deposits

Small, fossil rich alluvial exposures (Cornelia Formation) have been recorded north and east of Cornelia (**Fig. 7**). One of these sites is known as the Cornelia-Uitzoek vertebrate locality, and is the type site of the Cornelian Land Mammal Age (Butzer *et al.* 1974; Bender & Brink 1992; Brink & Rossouw 2000). The site consists of a pocket of Quaternary alluvial and colluvial gravels and clays in small basins of Karoo Ecca shale (**Fig. 8**). This pocket of Quaternary sediments had been cut through by a small stream, the Schoonspruit, which flows northwards into the Vaal River. This

resulted in the erosion of the Quaternary and Karoo sediments and the exposure of a rich Quaternary fossil occurrence. These Quaternary deposits are characterized by several distinct fossil mammal species, including *Stylochoerus compactus*, *Connochaetes laticornutus* and *Megalotragus eucornutus* (**Fig. 9**). During recent excavations a human first upper molar, was discovered during the systematic excavation of a densely-packed bone bed in the basal part of the sedimentary sequence (Brink et al. 2012). This sequence was dated by palaeomagnetism which correlated the bone bed to the Jaramillo subchron, between 1.07 and 0.99 Ma. This makes the specimen the oldest southern African hominine remains outside the dolomitic karst landscapes of northern South Africa.

Archaeology

A large Early Stone Age stone tool assemblage has been excavated at the Cornelia-Uitzoek vertebrate locality and includes Acheulean bifaces biface flakes, and a number of flakes (Butzer *et al.* 1974; Brink *et al.* 2012) (**Fig. 9**). A number of Middle Stone Age lithic scatters and associated faunal material have also been recorded by the author of this report during previous surveys conducted along a number of erosional gullies in the region. Although Cornelia lies well within a region characterized by the presence of numerous stone-walled settlements of the late Iron Age (Maggs 1976), there are currently no records of stone-walled settlements located near the town (**Fig. 10**).

Field Assessment

The field assessment indicates that the proposed development will primarily impact on superficial Quaternary soils and Jurassic dolerites (**Fig. 11**). Normandien Formation sedimentary rocks in the area may contain fossils, but the chances of finding fossils are very low. There is no evidence of intact or capped Stone Age artefacts, Iron Age structures or Quaternary fossils within the confines of the footprint. There are no indications of prehistoric structures or rock art within the footprint area. There is also no evidence of informal graves or historical structures older than 60 years (the town was established in 1920) within the confines of the footprint.

Impact Statement

Potential impacts are summarized in **Table 1**. The field assessment indicates that the proposed development will primarily impact on Quaternary-age surface deposits. However, potentially fossil-bearing Cornelia Formation outcrop is absent from the site. The dolerites are not palaeontologically significant.

There is no evidence of intact or capped Stone Age artefacts, Iron Age structures or Quaternary fossils within the confines of the footprint. There are no indications of prehistoric structures or rock art within the footprint area. There is also no evidence of informal graves or historical structures older than 60 years within the confines of the footprint.

Impact on potentially intact Stone Age archaeological remains, Iron Age structures or Quaternary fossils is considered unlikely. The terrain is not considered palaeontologically or archaeologically vulnerable.

Recommendation

In accordance with the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) there is no above-ground evidence of building structures older than 60 years, Stone Age archaeological remains, Iron Age structures or Quaternary fossils within the demarcated area.

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

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

References

- Brink, J.S. and Rossouw, L. 2000. New trial excavations at the Uitzoek-Cornelia type locality. *Navorsing van die Nasionale Museum* 16(6): 141 – 156.
- Brink, J.S., Herries, A.I.R. and Moggi-Cheggi, J. et al. 2012. First hominine remains from a 1.0 million year old bone bed at Cornelia-Uitzoek, Free State Province, South Africa. *Journal of Human Evolution* 63: 527 – 535.
- Butzer, K.W., Clark, J.D. and Cook, H.B.S. 1974. Geology, archaeology and fossil mammals of the Cornelia Beds. *Memoirs van die Nasionale Museum* 9.
- Maggs T. M. O’C 1976. *Iron Age Communities of the Southern Highveld*. Occasional Publications of the Natal Museum No. 2. Natal Museum, Pietermaritzburg.

Muntingh, D.J 1989. Die geologie van die gebied Frankfort. *Geologiese Opname*, Pretoria.

Tables & Figures

Table 1. Summary of potential impacts at the site.

Rock type / Age	Duration of Development	Palaeontological significance	Archaeological significance	Palaeontological Impact at site	Archaeological Impact at site
Residual soils, Alluvium (Quaternary)	Permanent	High	High	Low	Low
Dolerite Suite, <i>Jd</i> (Jurassic)	Permanent	Low	Low	None	None
Normandien Formation Beaufort Group (Permo-Triassic)	Permanent	Medium -High	Low	Low	Low

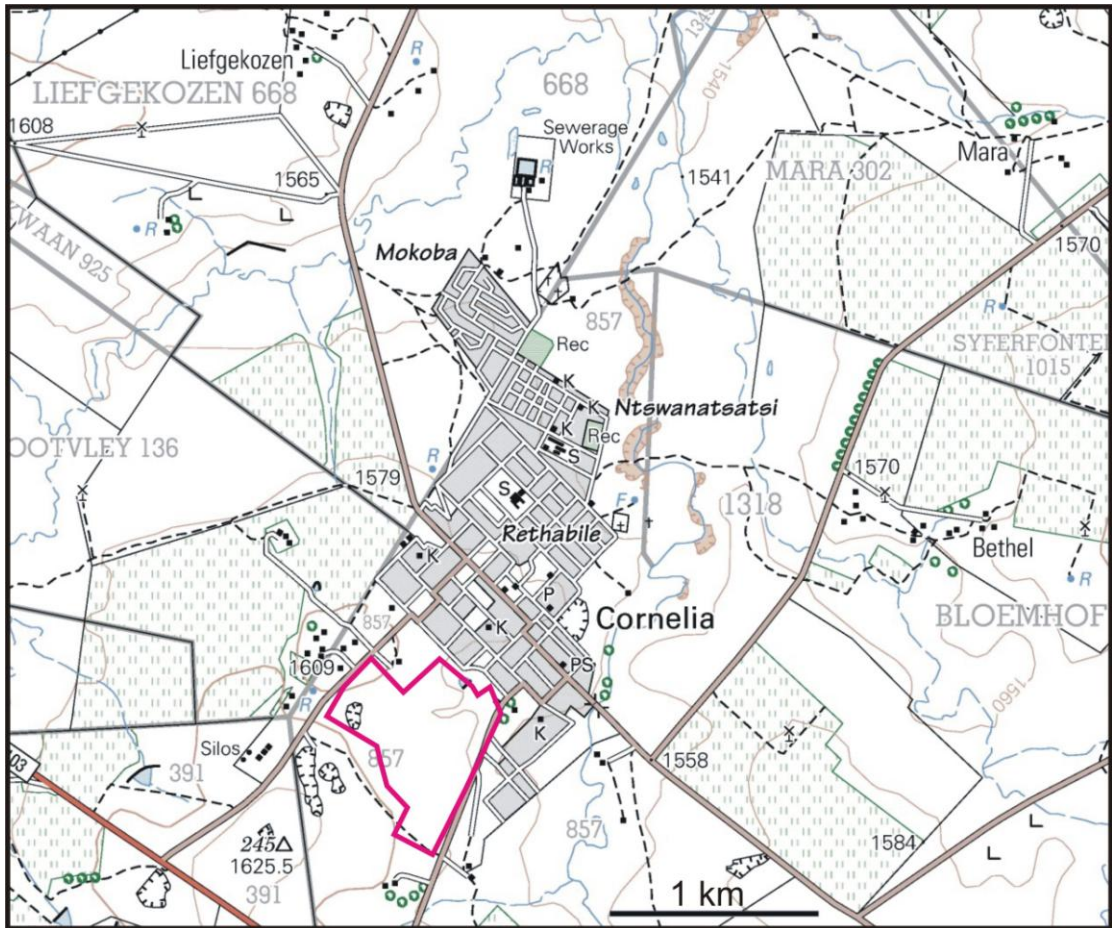


Figure 1. 1:50 000 scale topographic map (2728 BB Cornelia) of the study area.

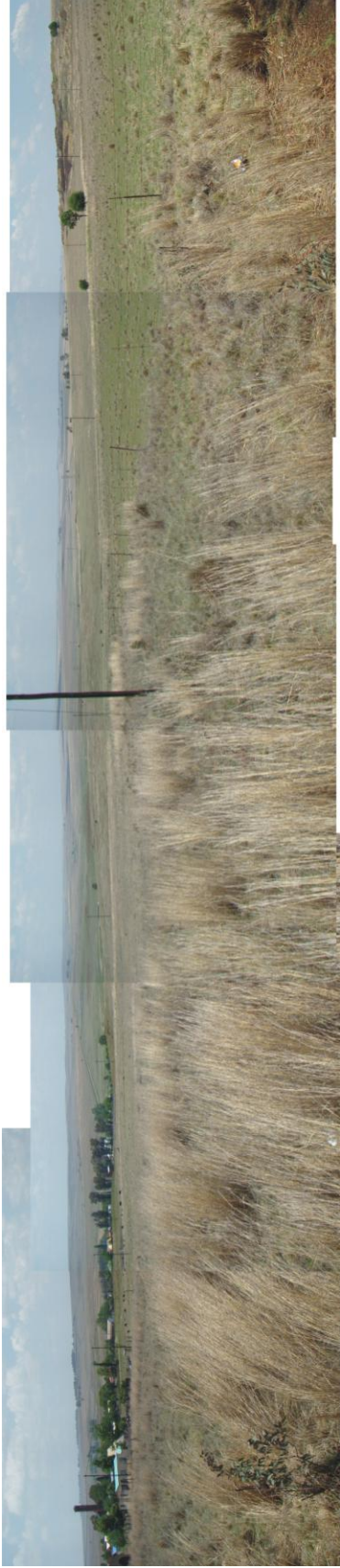


Figure 4. The affected area, looking south (above) and north (below).

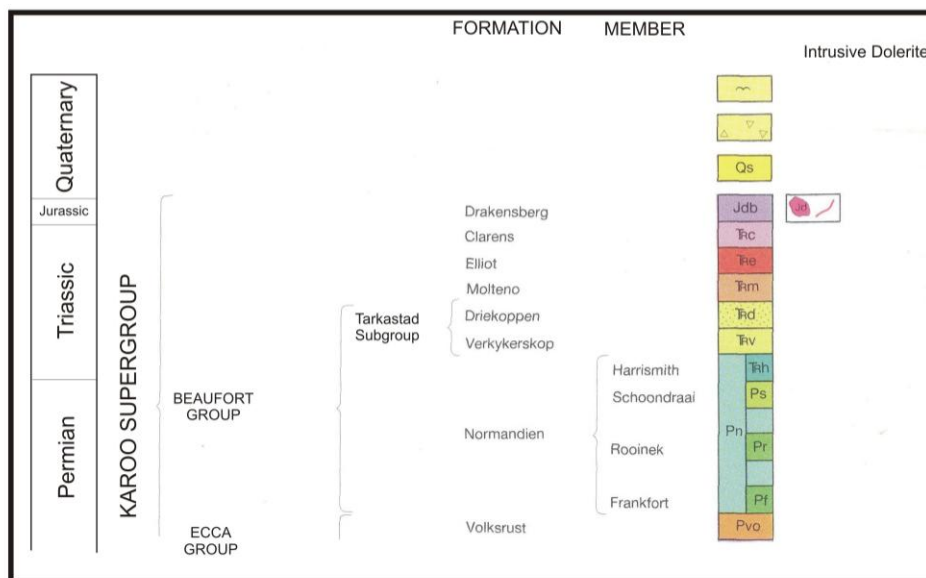
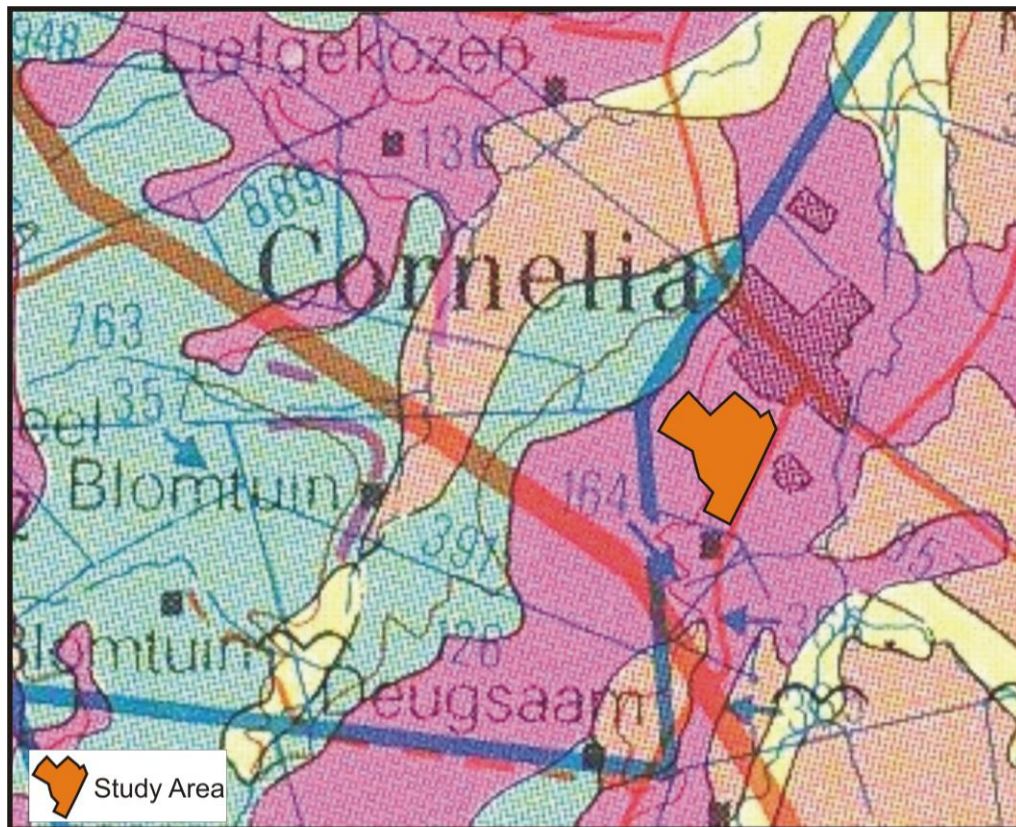


Figure 5. The geology around Cornelia is made up of Ecca Group shales (Volksrust Formation, *Pvo*), Beaufort Group sandstones and mudstones (Normandien Formation, *Pne*), Jurassic dolerite intrusions (Jd, Karoo Dolerite Suite), and superficial sediments of Quaternary age. (1:250 000 scale geological map 2728 Frankfort).

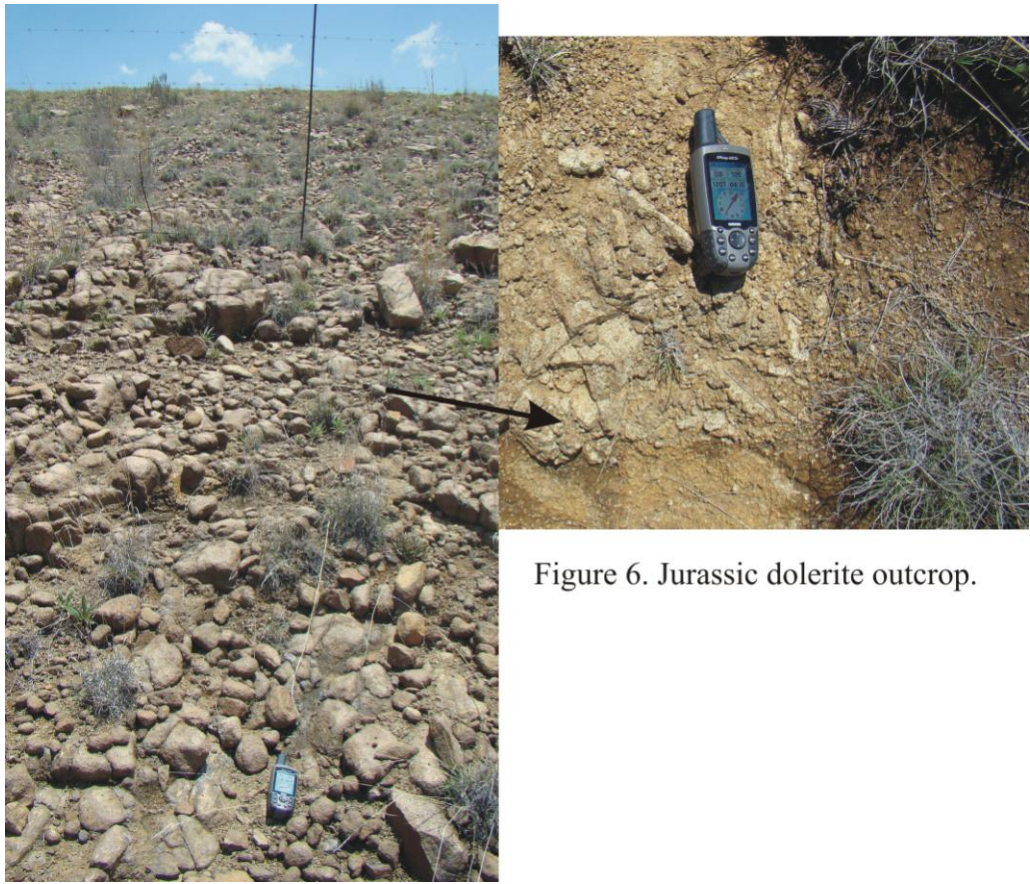
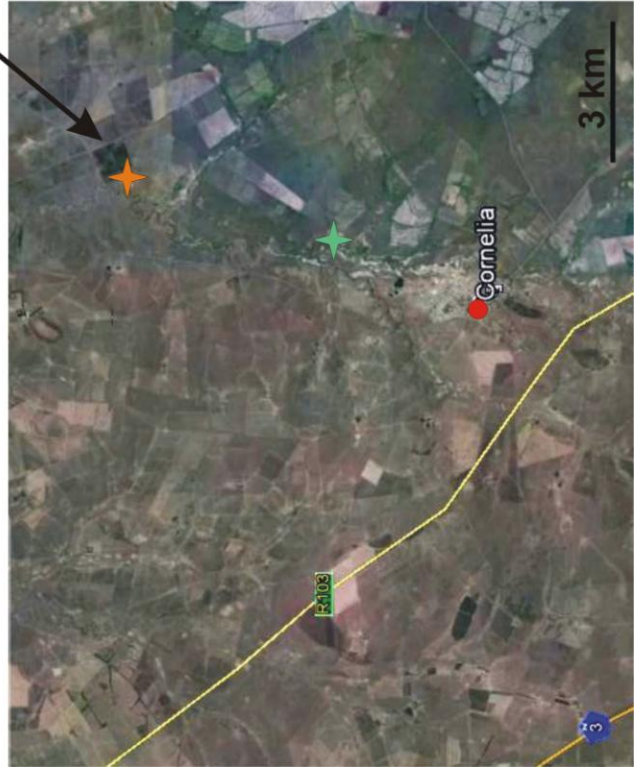


Figure 6. Jurassic dolerite outcrop.



Figure 7. The Cornelia-Uitzoek vertebrate locality (above) is the type site of the Cornelian Land Mammal Age.



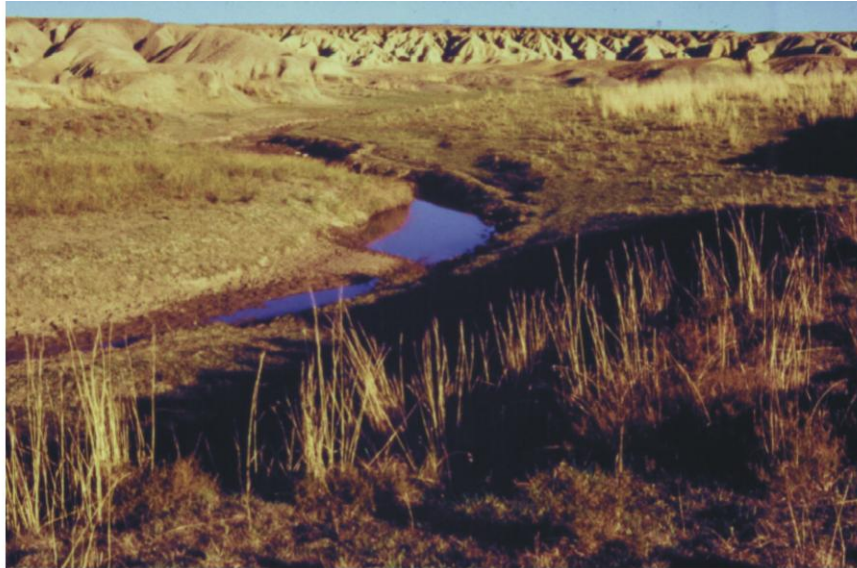


Figure 8. The Cornelia-Uitzoek vertebrate locality consists of a pocket of Quaternary alluvial and colluvial gravels and clays in small basins of Ecca Group shale.

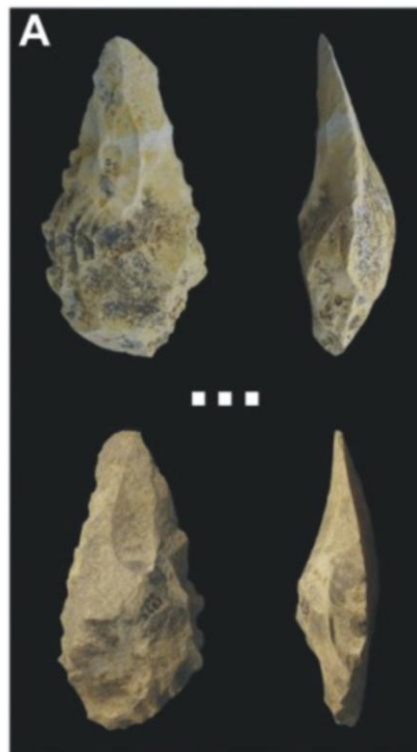


Figure 9. Skull and horn cores of *Megalotragus eucornutus* (above) and Acheulean bifaces (below) from the Cornelia-Uitzoek vertebrate locality.

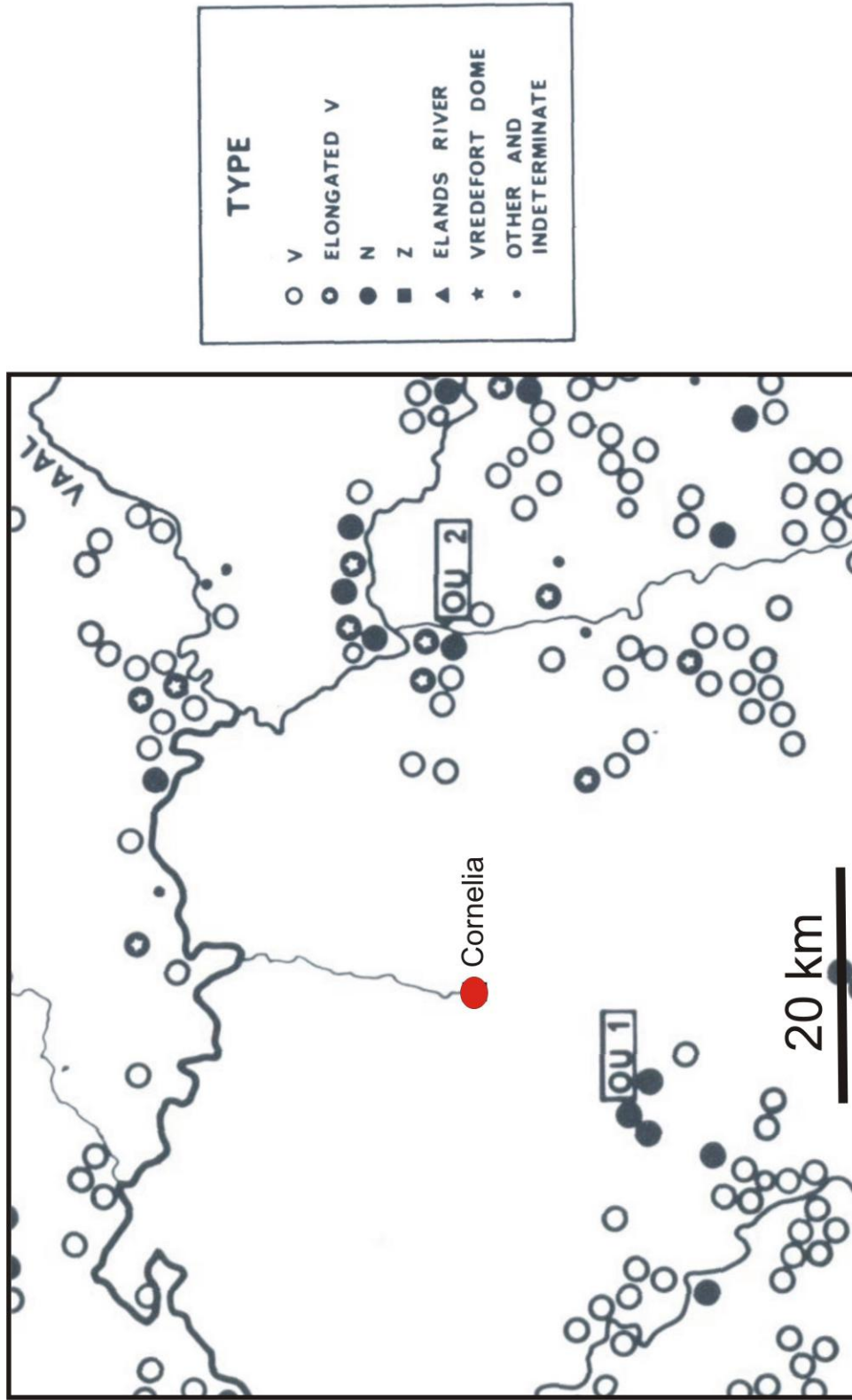


Figure 10. Distribution of late Iron Age, stone-walled settlements in the vicinity of Cornelia (after Maggs 1976).



Figure 11. Quaternary-age residual soils (topsoils).