Appendix D3
Phase 1 HIA

Phase 1 Heritage Impact Assessment of the Prieska Power Reserve Wonderpan Solar 1 Facility and associated 33 kV transmission line near Prieska, NC Province.

Report prepared by
Paleo Field Services
PO Box 38806
Langenhovenpark
9330

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Summary

A Phase 1 Heritage Impact Assessment was carried out for a proposed new solar development on portions 4 and 8 of farm Karabee 50 near Prieska in the Northern Cape Province. No fossils or fossil exposures were observed within superficial sediments, including exposures from an old borrow pit located in the solar footprint. The proposed development will primarily impact geologically recent and well-developed superficial overburden resting on Mbizane Formation outcrop. Surface limestones and geologically recent regolith in this area are generally not considered to be fossiliferous as it lies outside the boundary of intact (Neogene) terrace gravels, pans, springs, and well-developed pre-Holocene alluvial exposures. There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as intact surface scatters on the landscape within the boundaries of the proposed development footprints. Low density finds of locally derived and mostly isolated and weathered stone tools were observed, mapped and recorded within the two footprints. The sporadic evidence of Stone Age/Prehistoric presence is considered minor in terms of overall impact. There are no indications of rock art (engravings), stonewalled structures or historically significant buildings older than 60 years, or aboveground evidence of graves within the boundary of the. Both solar and powerline footprints are assigned an archaeological site rating of Generally Protected C (Low significance), but it is noted that the potential occurrence of isolated and unmarked graves, subsurface burial cairns or intact subsurface archaeological finds not recorded during this survey can never be excluded. Therefore, it is advised that the relevant heritage authority (SAHRA) and a qualified archaeologist be informed immediately in the event of potential archaeological exposure during the construction phase of the proposed project (Chance Find Protocol attached).

Contents

Introduction

A Phase 1 Heritage Impact Assessment was carried out for a proposed new solar development on portions 4 and 8 of farm Karabee 50 near Prieska in the Northern Cape Province (**Fig 1**). The region's unique and non-renewable archaeological and palaeontological heritage sites are 'Generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. As many such heritage sites are threatened daily by development, both the environmental and heritage legislation require impact assessment reports that identify all heritage resources including archaeological and palaeontological sites in the area to be developed, and that make recommendations for protection or mitigation of the impact of the sites.

Legislative framework

The primary legal trigger for identifying when heritage specialist involvement is required in the Environmental Impact Assessment process is the National Heritage Resources (NHR) Act (Act No 25 of 1999). The NHR Act requires that all heritage resources, that is, all places or objects of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance are protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures over 60 years of age, living heritage and the collection of oral histories, historical settlements, landscapes, geological sites, palaeontological sites and objects.

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 listed in Section 38 (1) of the NHR Act are:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length;
- Any development or other activity which will change the character of the site;
- Exceeding 5000 m² in extent;
- Involving three or more existing erven or subdivisions thereof;

- Involving three or more subdivisions thereof which have been consolidated within the past five years;
- Costs of which will exceed a sum set in terms of regulations by the South African Heritage Resources Agency (SAHRA).
- The rezoning of a site exceeding 10 000 m².
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

If a heritage resource is likely to be impacted by a development listed in Section 38 (1) of the NHR Act, a heritage assessment will be required either as a separate HIA or as the heritage specialist component (AIA or PIA) of an EIA.

The significance or sensitivity of heritage resources within a particular area or region can inform the EIA process on potential impacts and whether or not the expertise of a heritage specialist is required. A range of contexts can be identified which typically have high or potential cultural significance and which would require some form of heritage specialist involvement. This may include formally protected heritage sites or unprotected, but potentially significant sites or landscapes. The involvement of the heritage specialist in such a process is usually necessary when a proposed development may affect a heritage resource, whether it is formally protected or unprotected, known or unknown. In many cases, the nature and degree of heritage significance is largely unknown pending further investigation (e.g. capped sites, assemblages or subsurface fossil remains). On the other hand, it is also possible that a site may contain heritage resources (e.g. structures older than 60 years), with little or no conservation value.

Methodology

The significance of the affected area was evaluated using existing field data, database information and published literature. This was followed by a field assessment (site visit) of the affected areas. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant archaeological and palaeontological information, maps, Google Earth images and site records were integrated with data acquired during the on-site inspection.

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.

Potential impacts on heritage resources are summarized in **Table 1** and archaeological rating of the footprints are recommended using SAHRA-prescribed field rating categories in **Table 2**.

Locality Data

1 : 50 000 scalc topographic maps 2922 DB Pricska Oos & 2922DD Rcdlands

1 : 250 000 scale geological map 2922 Prieska

A 134 ha area and 1x 13 km long linear footprint has been identified for development of solar production and associated powerline on portions 4 and 8 of the farm Karabee 50 (**Fig. 2**). The solar development is located next to the N10 national road and about 17 km southeast of Prieska while the linear footprint will run from the solar footprint to the Camel Thorn substation located 11 km to the north (**Fig. 3 - 5**).

Individual GPS coordinates of the survey areas (**Fig. 2**):

Solar development:

A) 29°47'44.68"S 22°51'18.60"E
B) 29°48'26.17"S 22°52'3.30"E
C) 29°48'37.65"S 22°51'4.28"E
D) 29°48'3.58"S 22°51'6.99"E

Linear (powerline) footprint:

E) 29°47'58.14"S 22°51'23.56"E
F) 29°47'8.42"S 22°51'56.92"E
G) 29°46'59.05"S 22°52'10.12"E
H) 29°46'7.31"S 22°52'44.40"E
I) 29°46'3.68"S 22°52'50.17"E
J) 29°43'1.45"S 22°51'38.50"E
K) 29°42'43.45"S 22°51'0.86"E
L) 29°42'21.59"S 22°51'17.67"E
M) 29°42'6.81"S 22°50'43.53"E

Background

Geology

According to the 1: 250 000 scale geological map 2922 Prieska, the study area 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 6**). The mudstone and sandstone successions, tillites and conglomerates of the Mbizane Formation represents valley and inlet fill deposits 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 are located to the east and well outside the boundary of the proposed development footprint (Beukes 1979). Superficial deposits are primarily represented by late Tertiary surface limestones (T-Qc), windblown Kalahari Group sand (Qs), surface gravels and alluvium.

Palaeontology

Potential occurrences: Ichnofossil assemblages and remnant plant fossils associated with Dwyka Group sediments; Late Neogene vertebrate fossils associated with intact river terrace gravels and surface limestones; Quaternary vertebrate fossils associated with Pleistocene alluvial deposits.

Low diversity, non-marine ichnofossil assemblages have been recorded in the Mbizane Formation 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) (**Fig 7 & 8**). 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 late Neogene river terraces between Douglas and Prieska yet, but a variety of fossil fauna have been retrieved from gravel terraces along the Lower Vaal River basin (Cooke 1949). 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 *Elephas iolensis (*Maglio, and Cooke 1978). Except for a few bovid horn core remains found in limestone quarries, there are no records of Quaternary fossils from the immediate vicinity of Prieska (**Fig. 8**). A fossilized horn core of an extinct alcelaphine was found along the Ongers River near Britstown, while Florisian type faunal remains have been excavated from an archaeological site at Bundu Farm Pan near Copperton (Brink *et al*. 1995; Kiberd 2006).

Archaeology

Potential occurrences: Intact Stone Age open sites; burial cairns, unmarked graves, pastoralist kraals, rock art.

The archaeological footprint in the region are primarily represented by Stone Age archaeology, rock art localities, structural remnants dating back to the Anglo Boer War and its aftermath, as well as graveyards and other historical structures dating more than 60 years ago. The Stone Age archaeological footprint in the region is represented by Early, Middle and Later Stone Age sites associated with pans and alluvial contexts (see **Fig. 9**), while the landscape in general is characterized by low-density surface scatters (Beaumont et al. 1995; Kiberd 2006). Rock engravings have been recorded in the younger valley fills along the steeper slopes located near the eastern and south-eastern margins of the Asbesberge north of Prieska (van Riet Low 1949). In addition, rock art sites have been recorded on a number of farms between Prieska and Douglas (**Fig. 10**). Historical ruins and graveyards associated with the asbestos mining industry during the first half of the 20th century are located at various localities north and south of Prieska. Before the town of Prieska was founded in 1882, early travelers frequently encountered Koranna and Bushmen groups in the region (Burchell 1824; Raper 1987; Skead 2009). The principal Khoikhoi inhabitants of the Middle Orange River were the Einiqua who belonged to the same language group as the Namaqua and Korana, namely the Orange River Khoikhoi (Penn 2005). The Einiqua occupied the area around and east of the Augrabies Falls while the Korana occupied the Middle-Upper Orange River further to the east between Prieska and the Vaal-Orange confluence (**Fig. 11 & 12**). A large number of burial cairns were excavated near the Orange River in the Kakamas area and appear to be related to Korana herders (Morris 1991, 1995). It is noted that while Bushmanland sites in the surrounding area appear to be ephemeral occupations by small hunter-gatherer groups, substantial herder encampments found along the Orange River

itself indicate that the banks and floodplains of the river were more intensely exploited (Morris & Beaumont 1991). Hinterland sites are mainly restricted rock shelters near mountainous terrain sand dune deposits, or around seasonal pans and springs (Beaumont et al. 1995). Prior to the end of 18th century, Iron Age occupation *sensu lato* was absent from the region with the most southerly distribution of Sotho-Tswana Iron Age settlement in the northern Cape limited to north of the Orange River (Maggs 1974; Humphreys 1976). This changed during the first half of the 19th century when a small number of Xhosa-speaking communities settled in the region (Zachariou, 2013). According to Kallaway (1982) Danster arrived at the Orange River from the Eastern Cape, along with his followers, in 1795 and from as early as 1800 to 1805 Xhosa – speaking groups along the Middle Orange River raided and traded with San, Korana and Sotho-Tswana Tlhaping groups to the north east. By the end of the first decade of the 19th century, Xhosa speakers intentionally settled in the Pramberg and Karreeberg regions to the south of Prieska (Anderson 1985; Zachariou, 2013, **Fig. 13**).

Field Assessment

Solar Development

The study area is capped by bedrock – derived surface gravels, surface limestones (*T-Qc*), occasional pockets of well - developed Quaternary sand (*Qs*) and shallow alluvium from the Karabeeloop, resting on Mbizane Formation outcrop (**Fig. 14**). No fossils or potential fossil exposures were observed within superficial sediments, including exposures from an old borrow pit situated next to the highway. There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as intact surface scatters on the landscape within the boundaries of the proposed development footprints. Low density (< 1 / 100 m) isolated finds were observed as locally derived surface scatters (**Fig 15**). There are no indications of rock art (engravings), stonewalled structures or historically significant buildings older than 60 years, or aboveground evidence of graves within the boundary of the site.

Powerline

The linear footprint traverses bedrock – derived surface gravels, surface limestones (*T-Qc*), occasional pockets of well - developed Quaternary sand (*Qs*) and shallow alluvium from the nearby Karabeeloop, resting on Mbizane Formation outcrop. No fossils or potential fossil exposures were observed within superficial sediments. Low density

scatters (< 1 / 200 m) of locally derived and mostly isolated and weathered stone tools were observed along the route. However, there is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as surface scatters within the powerline footprint. There are also no indications of rock art (engravings), stonewalled structures or historically significant buildings older than 60 years, or aboveground evidence of graves within the boundaries of the sites.

Impact Statement and Recommendation

The proposed development will primarily impact geologically recent and well-developed superficial overburden resting on Mbizane Formation outcrop (**Table 1**). The Mbizane Formation is not considered to be highly fossiliferous, while surface limestones and geologically recent regolith in this area lies outside the boundary of intact (Neogene) terrace gravels, pans, springs, and well-developed pre-Holocene alluvial exposures. The farm is located within a wider region that has previously yielded ample archaeological evidence of prehistoric human occupation (Humphreys 1982; Beaumont & Vogel 1995). However, sporadic evidence of Stone Age/Prehistoric presence is considered minor in terms of overall impact. The low-density, *ex situ* stone tool component observed in both footprints has been mapped and recorded. Both solar and powerline footprints are assigned an archaeological site rating of Generally Protected C (Low significance, **Table 2**), but it is noted that the potential occurrence of isolated and unmarked graves, subsurface burial cairns or intact subsurface archaeological finds not recorded during this survey can never be excluded. Therefore, it is advised that the relevant heritage authority (SAHRA) and a qualified archaeologist be informed immediately in the event of potential archaeological exposure during the construction phase of the proposed project.

References

Almond, J.E. & Pether, J. 2008. *Palaeontological heritage of the Northern Cap*e. Interim SAHRA technical report, 124 pp. Natura Viva cc, Cape Town.

Anderson, E. 1985. A History of the Xhosa of the Northern Cape 1795-1879. Masters Thesis. Cape Town: University of Cape Town.

Brink, J.S., de Bruiyn, H., Rademeyer, L.B. and van der Westhuizen, W.A. 1995. A new *Megalotragus priscus* (Alcelaphini, Bovidae) from the central Karoo, South Africa. *Palaeontologia africana* 32: 17-22

Beaumont, P.B., Smith, A.B. & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In: Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: 236-264. Cape Town: University of Cape Town Press.

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.

Burchell W.J. 1824. *Travels in the interior of southern Africa*. Vol II. Longman and Green. London.

Cole, D.I. and McLachlan, I.R. 1994. Oil shale potential and depositional environment of the Whitehill Formation in the main Karoo Basin. *Report Geol. Surv. S. Afr*. 1994-0213.

Cooke, H.B.S. 1949. Fossil mammals of the Vaal River deposits. Geological Survey of South Africa Memoir 35: 1 – 109.

Humphreys, A.J.B. 1976 Note on the Southern Limits of Iron Age Settlement in the Northern Cape. *South African Archaeological Bulletin*, Vol. 31 (121/122): 54-57.

Humphreys, A.J.B. 1982. Cultural Material from Burials on the Farm St. Clair, Douglas Area, Northern Cape. *South African Archaeological Bulletin*, 37 (136) 68-70.

Johnson M.R. et al 2006. Sedimentary rocks of the Karoo Supergroup. **In**: Johnson, M.R, Anhaeusser, C.R. and Thomas, R.J. (Eds.) *The geology of South Africa*, pp. 461 - 500. Geological Society of South Africa, Johannesburg & the Council for Geoscience, Pretoria.

Kallaway, P. 1982. Danster and the Xhosa Of the Gariep: Towards a Political Economy of the Cape Frontier 1790-1820. *African Studies* 41:143-160.

Kiberd, P. 2006. Bundu Farm: a report on archaeological and palaeoenvironmental assemblages from a pan site in Bushmanland, Northern Cape, South Africa. *South African Archaeological Bulletin* 61: 189-201.

Maglio, V.J. and Cooke, H.B.S. 1978. Evolution of African Mammals. Cambridge, Mass. Harvard University Press.

Morris, D. & Beaumont, P.B. 1991. !Nawabdanas: archaeological sites at Renosterkop, Kakamas District, Northern Cape. *South African Archaeological Bulletin* 46:115-124.

Morris, A.G. 1995. The Einiqua: an analysis of the Kakamas skeletons. In: Smith, A.B. (ed.) *Einiqualand: studies of the Orange River frontier*. pp. 110 - 164. Cape Town: University of Cape Town Press.

Partridge, T.C. & Maud, R.R. 2000. *The Cenozoic of Southern Africa*. Oxford Monographs on Geology and Geophysics No. 40.

Penn, N. 2005. *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century.* Athens, Ohio and Cape Town: Ohio University Press and Double Storey Books.

Smith, R. M. H. 1988. Palaeoenvironmental reconstruction of a Cretaceous crater-lake deposit in Bushmanland, South Africa. *Palaeoecology of Africa and Surrounding Islands* 19:27–41.

Visser, J.N.J., Loock, J.C. *et al*. 1977-78. The Dwyka Formation and Ecca Group, Karoo sequence in the northern Karoo Basin, Kimberley-Britstown area. *Annals of the Geographical Survey of South Africa* 12: 143 – 176.

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

Paleo Field Services act as an independent specialist consultant and do not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. Paleo Field Services has no interest in secondary or downstream developments as a result of the authorization of this project.

Tables and Figures

Table 1. Summary of impacts within the proposed study area.

Impact	Extent of Development	Duration	Probability of adverse impact	Confidence	Mitigation	Rating
Impact of proposed development on palaeontological heritage	Local	Permanent	Low; Superficial deposits (T-Qc, Qs, alluvium) Dwyka tillites & mudstones	High	Phase 1 Evaluation Protocol for finds	C (GP.C)
Impact of proposed development on archaeological heritage	Local	Permanent	Low: No *aboveground* evidence of *in situ* archaeological features, graves or structures older than 60 years	High	Phase 1 Evaluation Protocol for finds	C (GP.C)

Table 2. Field rating categories as prescribed by SAHRA.

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

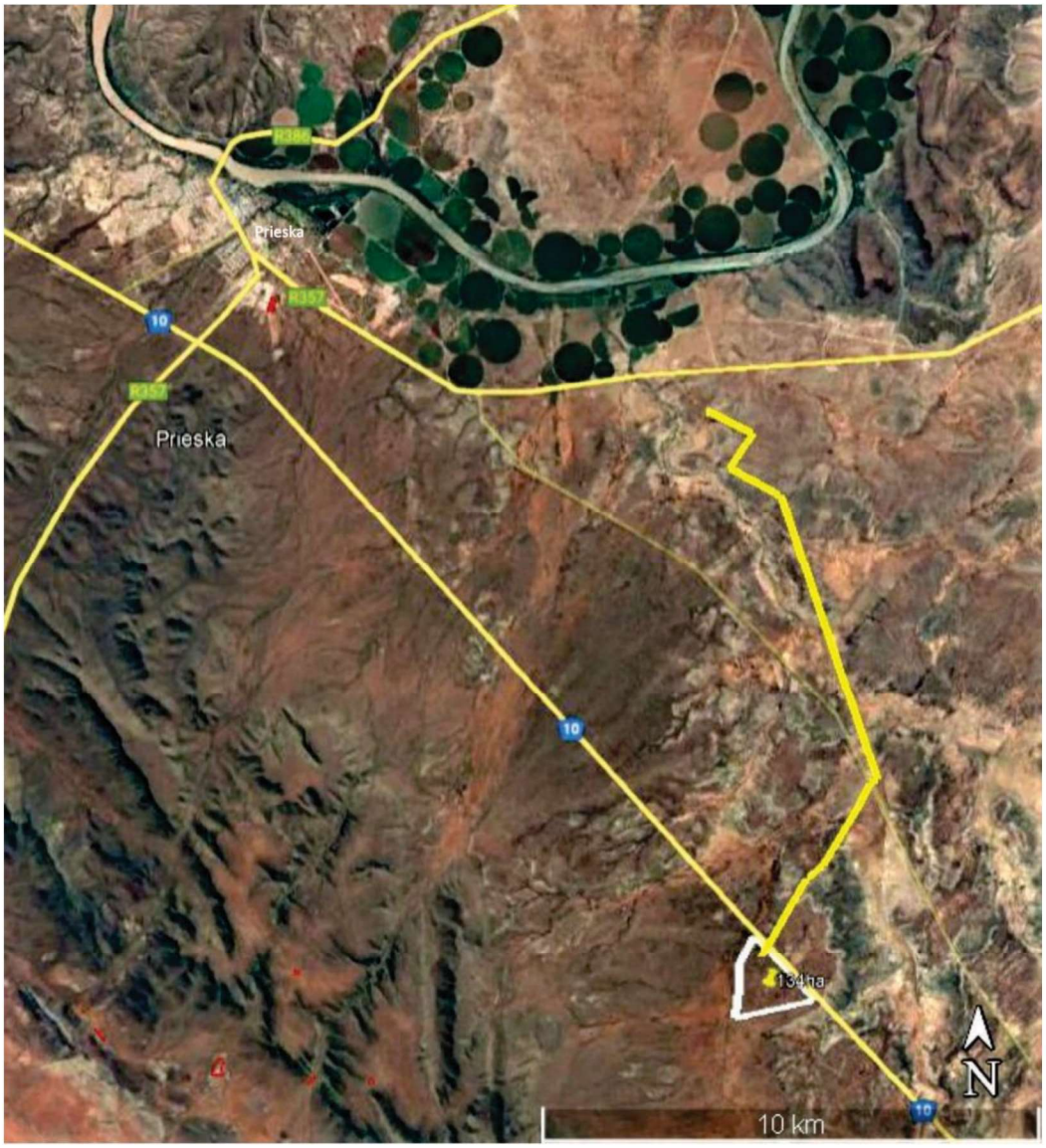


Figure 1. Aerial view of the proposed development.

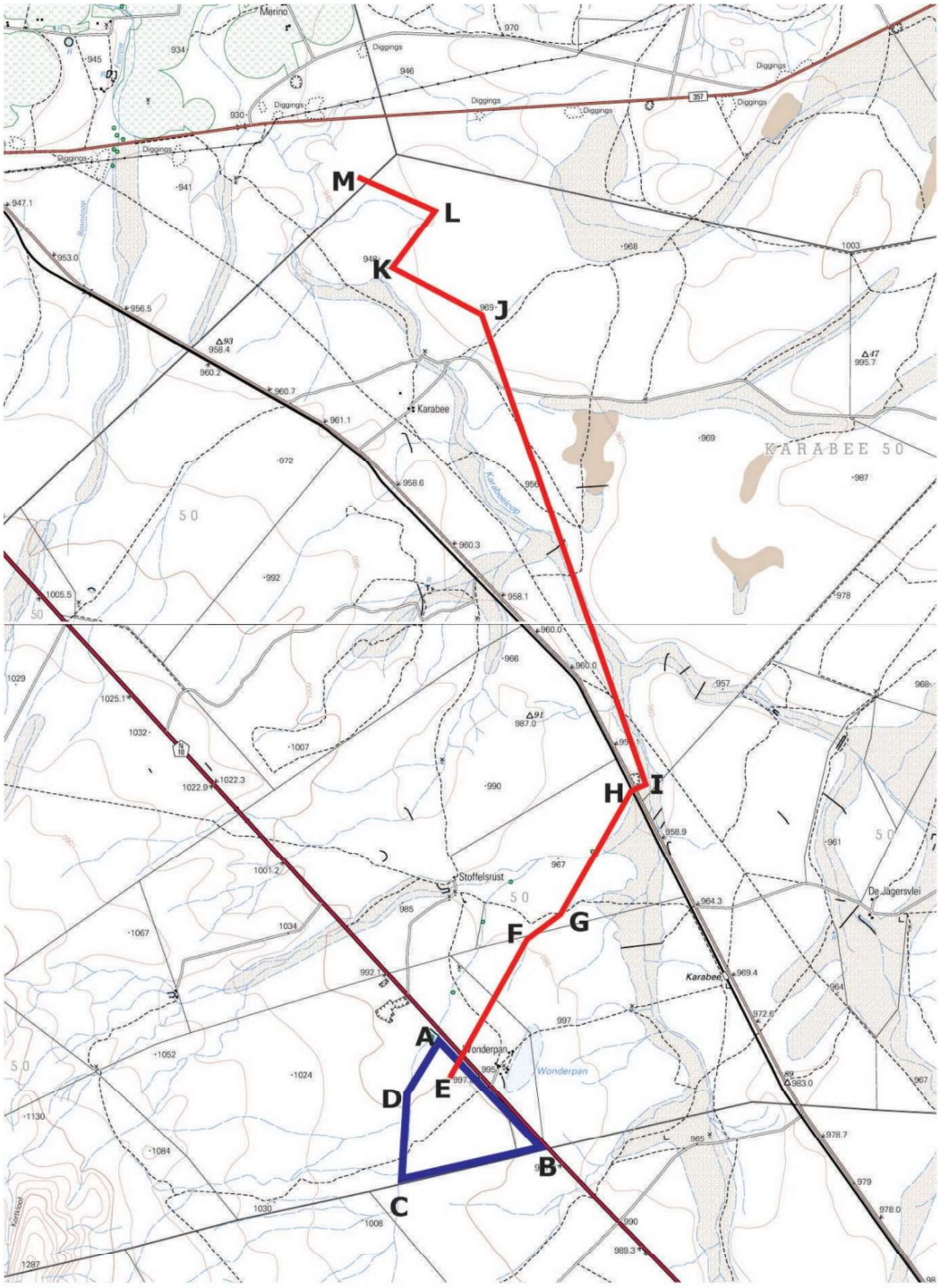
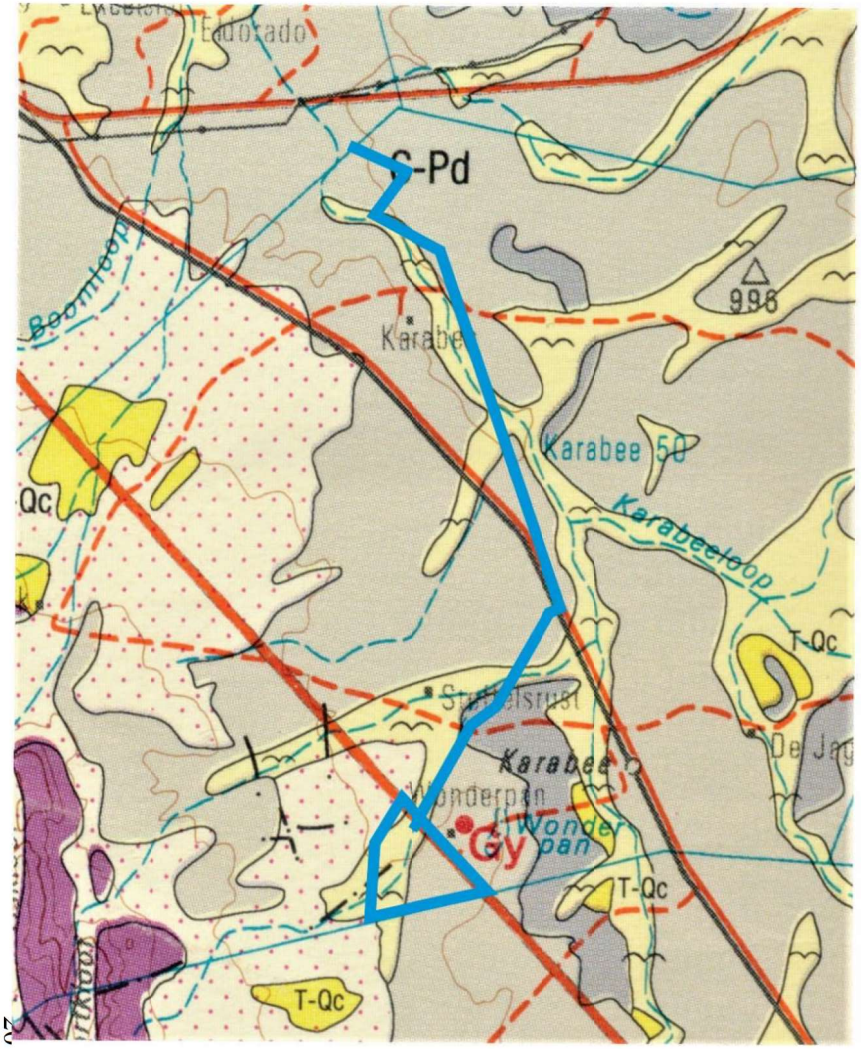


Figure 2. Map of the proposed development (stars) on farm Karabee 50 (portion of 1:50 000 topographic maps 2922 DB Prieska Oos & 2922DD Redlands).

Figure 3. Aerial view of proposed development footprints.

Figure 4. General view of the solar footprint, looking south (top), north (middle) and west (bottom).

Figure 5. General view of terrain along the powerline footprint.



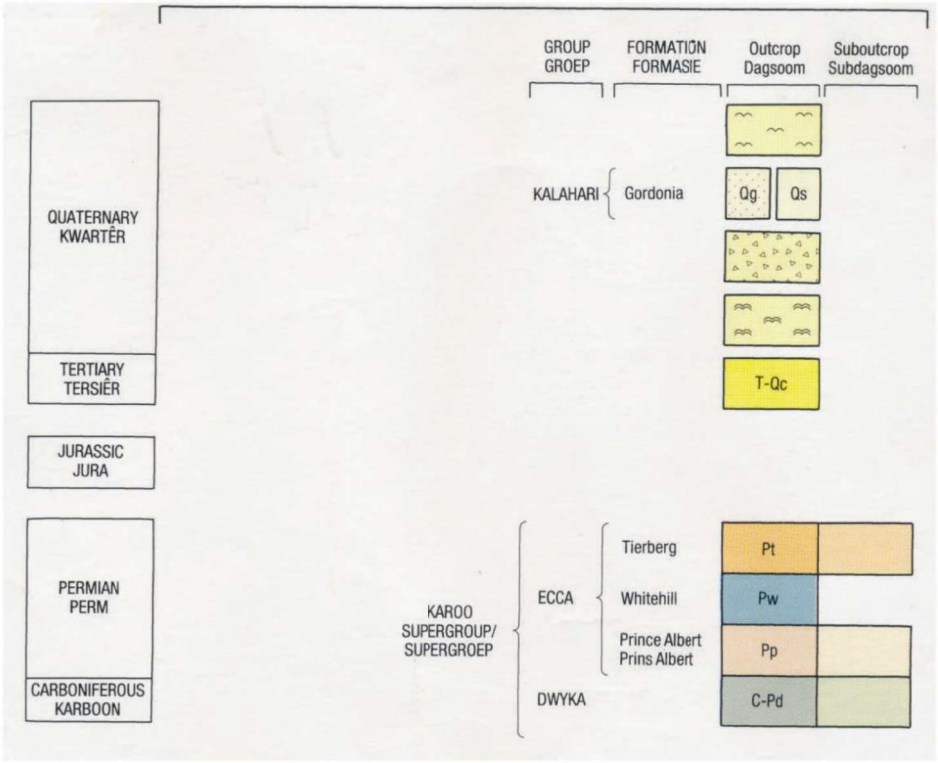


Figure 6. According to the 1: 250 000 scale geological map 2922 Prieska, the study area is underlain by glacially-related sediments of the Mbizane Formation (*C-Pd*; Dwyka Group, Karoo Supergroup). Superficial deposits are primarily represented by late Tertiary surface limestones (T-Qc), windblown Kalahari Group sand (Qs), surface gravels and alluvium.

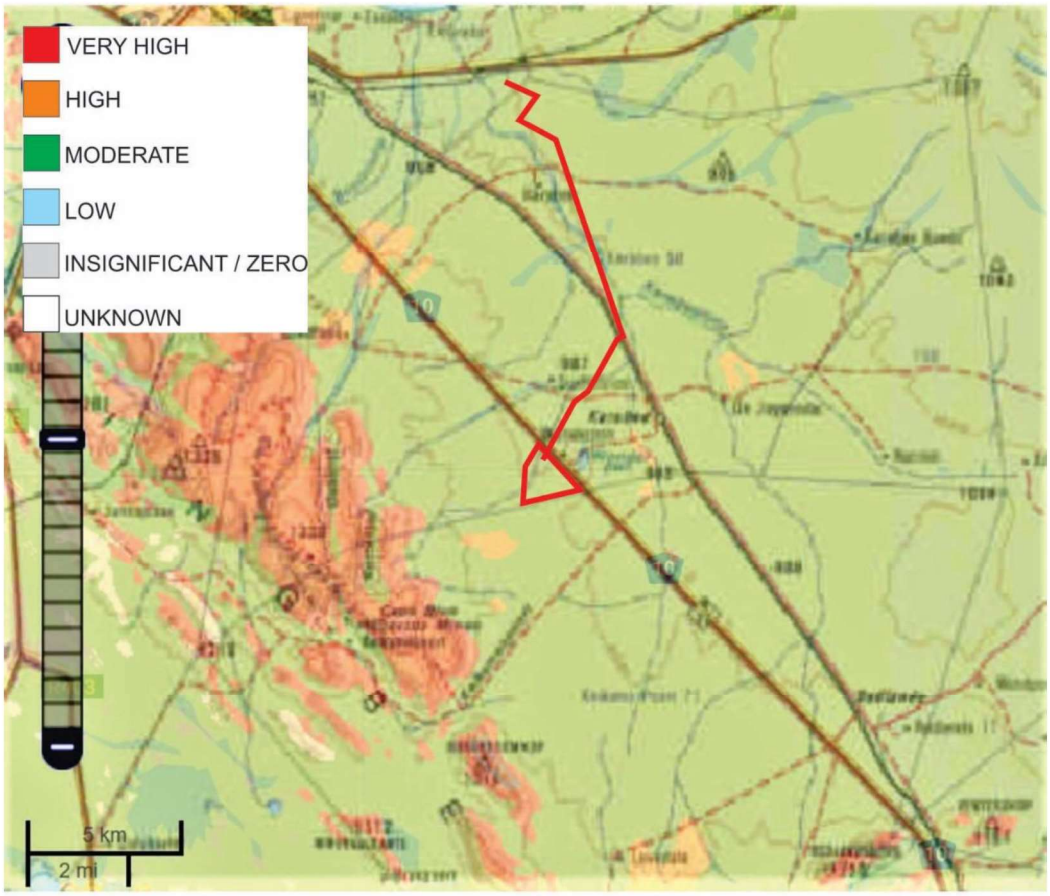


Figure 7. Proposed development footprints (red polygon & line) marked on SAHRIS palaeosensitivity map (Sahris 2022).

Figure 8. Examples of exposed Dwyka sediments with unbedded tillite and concentrated erratics (above), poorly bedded mudstones exposed by stream incision (below left) and ungulate fossils retrieved from an old road quarry near Prieska.

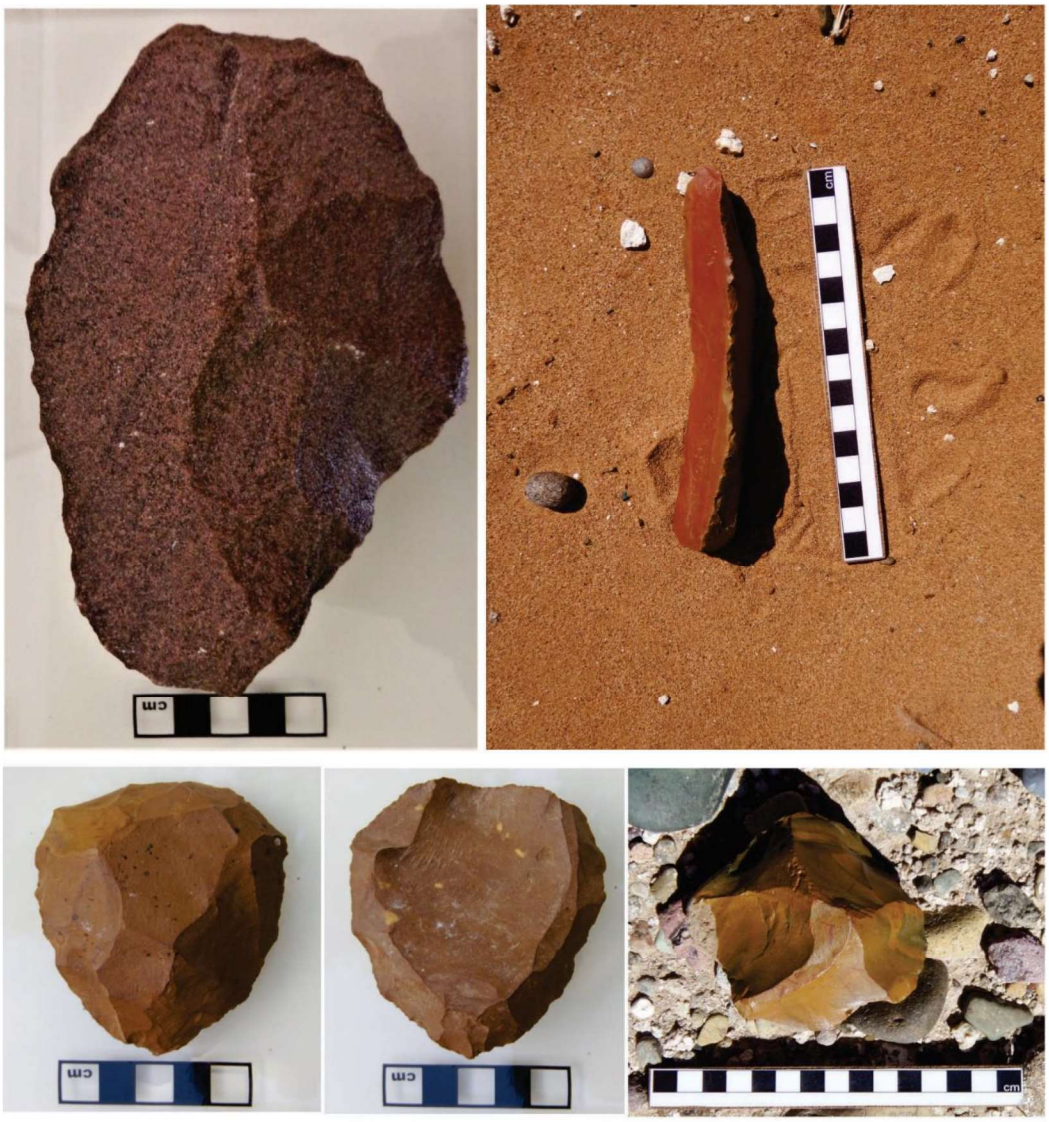


Fig 9. Uncapped Stone Age surface scatters previously recorded along the Orange River between Douglas and Prieska (farms Marksdrift, Brakfontein, Nuwejaarsspruit and Kliphuis). Early Stone Age LCT on diabase (above left), MSA parallel flake blade on banded iron stone (above right), MSA Levallois core on hornfels (below left & center) and LSA radial core on banded iron stone (below right).

Figure 10. Examples of rock engraving recorded on diabase along the Orange River between Douglas and Prieska.

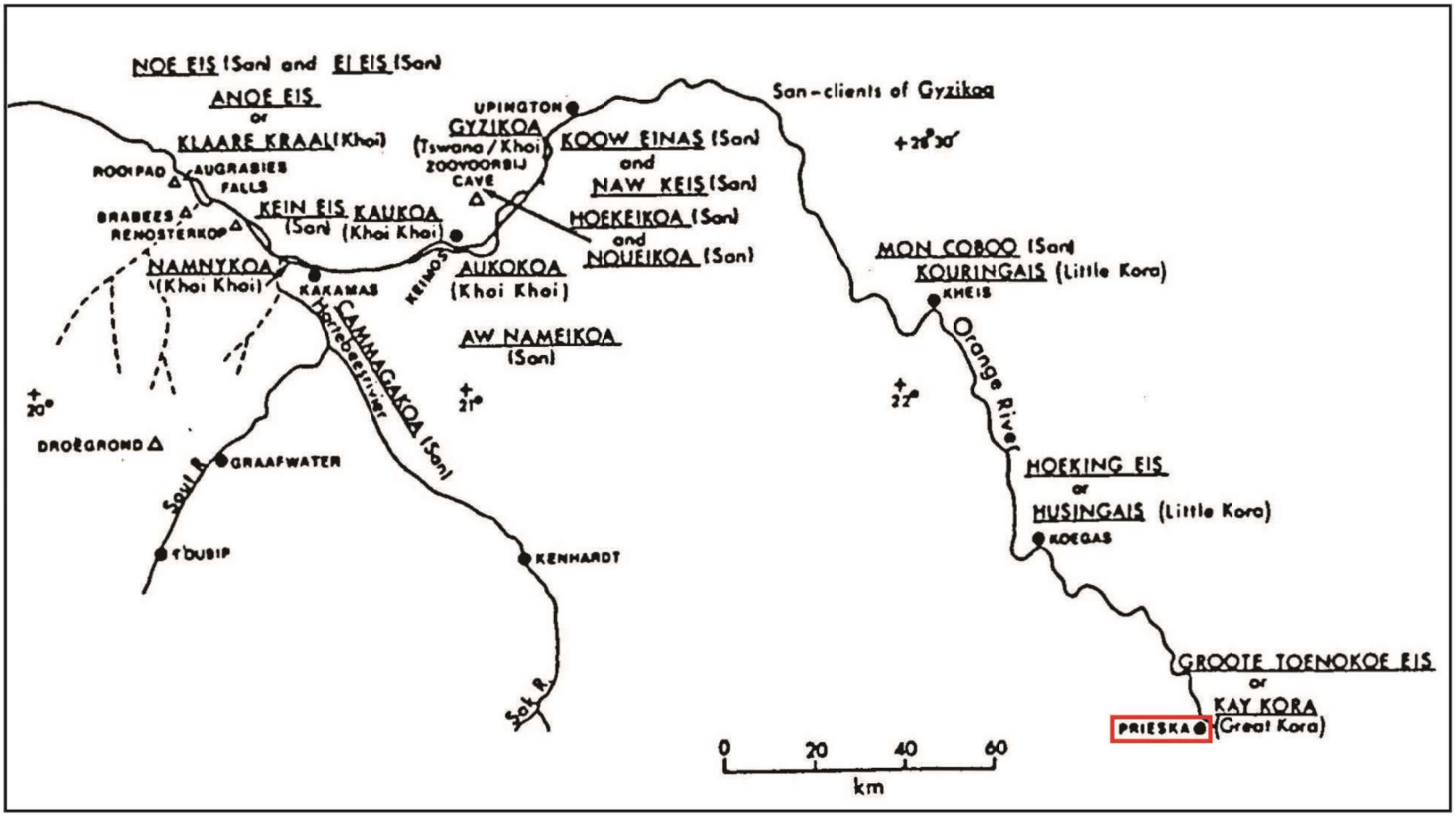


Figure 11. Distribution of Khoisan communities during the 18th century between Prieska and Kakamas (after Penn 1995) and southern limits of Tswana settlement during the 18th and 19th centuries (after Humphreys 1976).

Figure 12. Remains of early 19th century pastoralist kraals previously recorded along the Orange river between Douglas and Prieska.

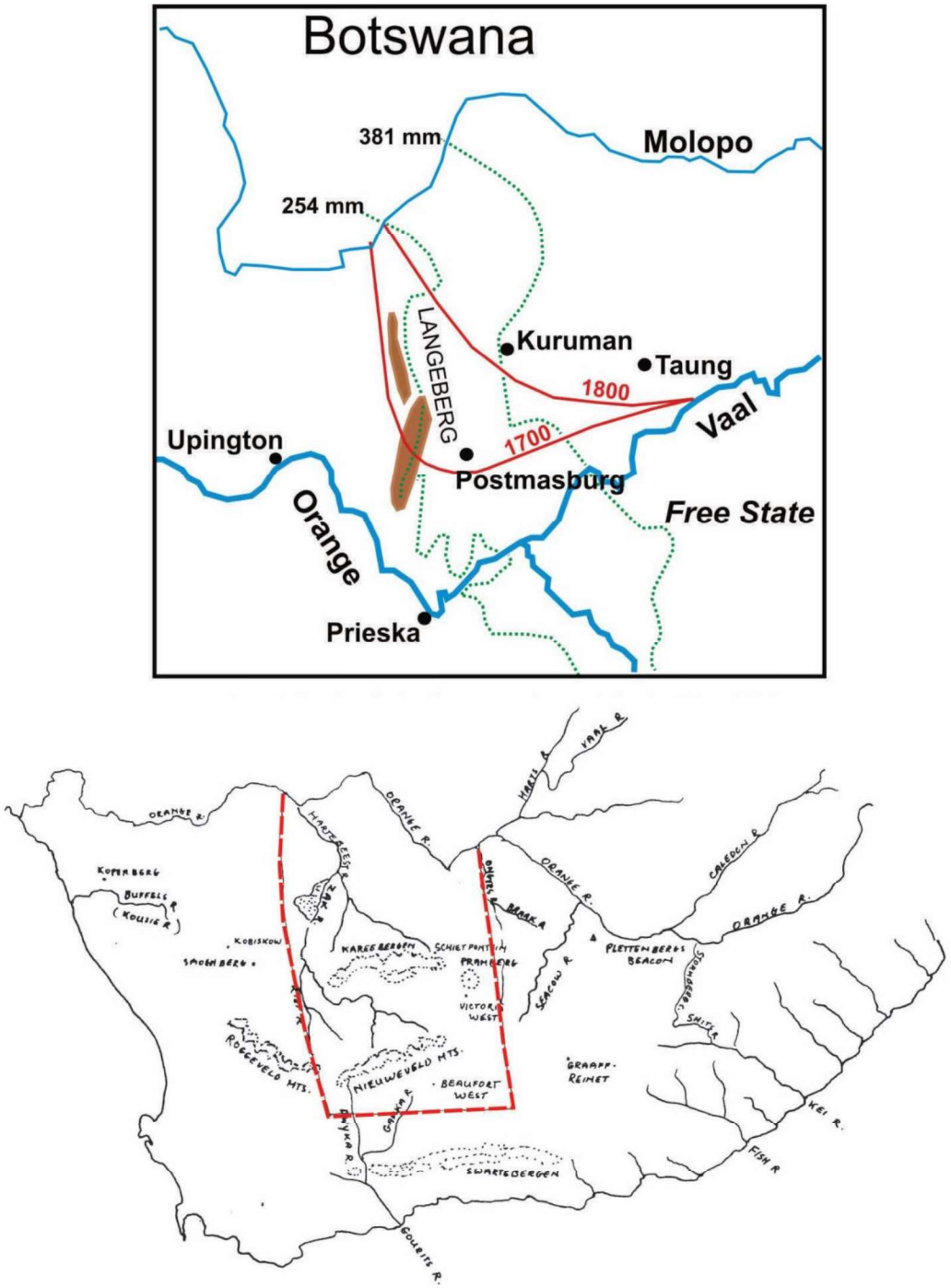


Figure 13. Southern limits of Tswana settlement during the 18th and 19th centuries, above (after Humphreys1976) and area inhabited by the Xhosa of the northern Cape, below (after Anderson 1985).

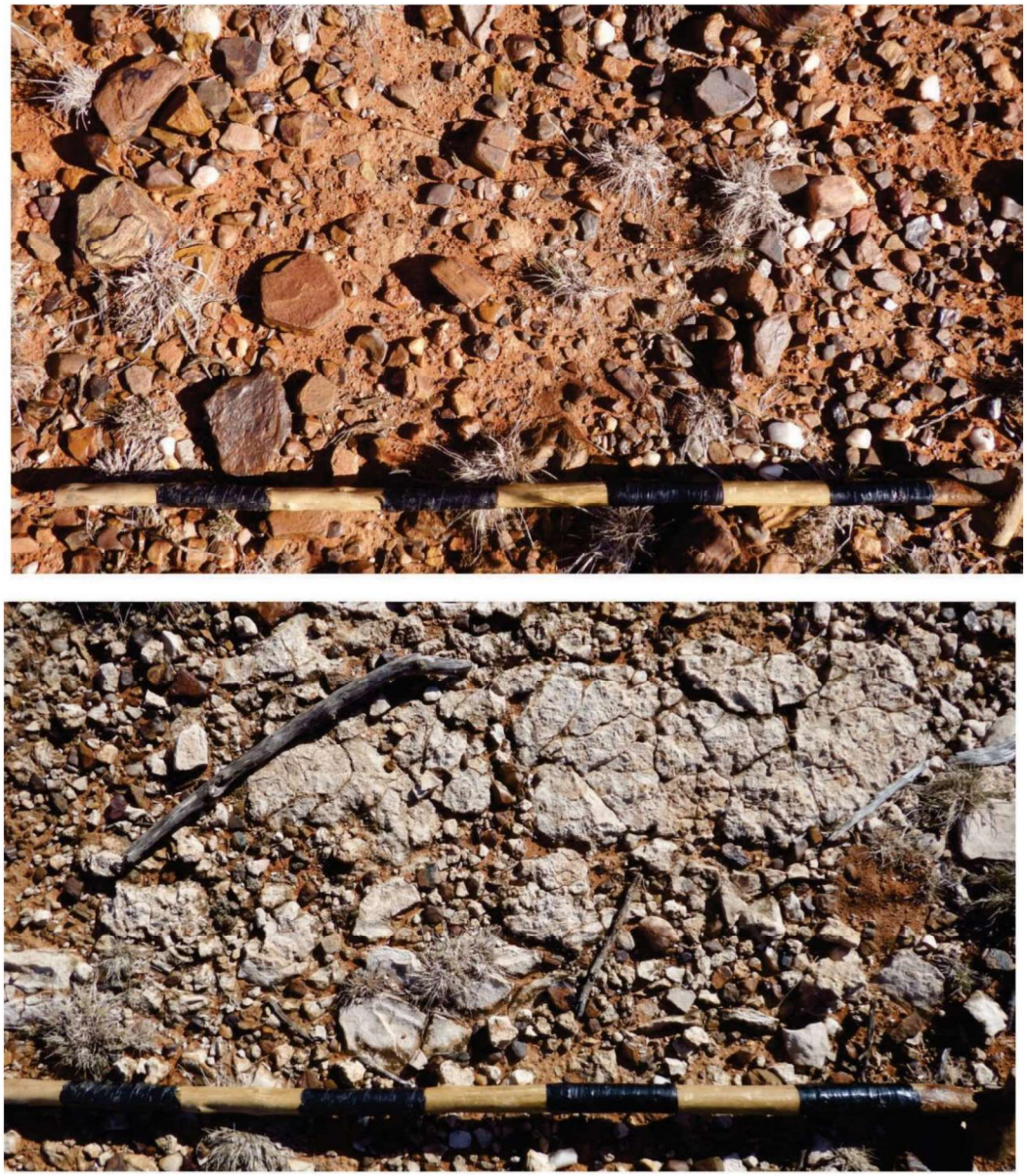


Figure 14. The study area is primarily capped by bedrock – derived surface gravels (above) and surface limestones (below).

Figure 15. Examples of low-density scatters recorded during survey: high-backed blade with secondary retouch and small core on banded ironstone (above) and ventral aspect of convergent flake-blade and scraper (below).