Phase 1 Heritage Impact Assessment for establishment of new agricultural pivots on the farm Zwemkuil 37, Prieska, NC Province.

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Summary

A Phase 1 Heritage Impact Assessment was carried out for a proposed new agricultural development of sixteen individual areas, covering 448 ha in total, on the farm Zwemkuil 37 near Prieska in the Northern Cape Province. The proposed developments will largely impact geologically recent and well-developed superficial overburden. Surface limestones and geologically recent aeolian sand overburden in the region are generally not considered to be fossiliferous in the absence of intact (Neogene) terrace gravels, pans, springs, and pre-Holocene alluvial exposures. Areas 1, 4, 10, 11, 12 and part of 5 have been degraded by previous agricultural activities. The farm is located within a wider region that has previously yielded ample archaeological evidence of prehistoric human occupation, but visible evidence of Stone Age/Prehistoric presence at two out of 16 areas is considered minor in terms of overall impact. A low-density, *ex situ* stone tool component observed in Areas 5 and 8 has been mapped and recorded. All the areas 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 observed 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 (protocol for finds included).

Contents

Introduction

A Phase 1 Heritage Impact Assessment was carried out for a proposed new agricultural development on the farm Zwemkuil 37 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. Archaeological Impact Assessments (AIAs) and Palaeontological Impact Assessments (PIAs), or overarching Heritage Impact Assessments (HIAs) are most often specialist reports that form part of the wider heritage component of Environmental Impact Assessments (EIAs) required in terms of the National Environmental Management Act or of the Environment Conservation Act by the provincial Department of Environment Affairs; or Environmental Management Plans (EMPs) required by the Department of Minerals and Energy.

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. In most cases it will be necessary to engage the professional opinion of a heritage specialist in determining whether or not further heritage specialist input in an EIA process is required.

Methodology

The significance of the affected area was evaluated on the basis of existing field data, database information and published literature. This was followed by a field assessment

(site visit) of the affected area. 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 consulted and integrated with data acquired during the on-site inspection.

The task also involved identification and assessment of possible palaeontological and archaeological heritage with the following 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 site significance classification standards, as prescribed by SAHRA, were used for the purpose of this evaluation (**Table 2**).

Locality Data

1 : 50 000 scale topographic map 2922DB Prieska Oos

1 : 250 000 scale geological map 2922 Prieska

Sixteen individual areas, covering 448 ha in total, have been identified for development on the farm Zwemkuil 37, which is located between the Orange River and the R357 provincial road and about 80 km northeast of Prieska in the Northern Cape Province (**Fig. 2 - 14**).

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

Area 1a) 29°25'6.36"S 23° 1'17.56"E
Area 1b) 29°25'14.48"S 23° 1'32.24"E
Area 2) 29°25'26.88"S 23° 3'15.46"E
Area 3) 29°25'23.40"S 23° 4'10.13"E
Area 4) 29°25'37.34"S 23° 5'31.40"E
Area 5) 29°25'49.39"S 23° 5'51.67"E
Area 6a) 29°25'47.90"S 23° 5'4.50"E
Area 6b) 29°25'47.83"S 23° 5'19.73"E
Area 7) 29°25'48.48"S 23° 4'31.27"E
Area 8) 29°25'50.14"S 23° 2'45.50"E

Area 9a) 29°25'36.41"S 23° 2'13.75"E
Area 9b) 29°25'48.61"S 23° 2'22.98"E
Area 9c) 29°25'58.66"S 23° 2'18.27"E
Area 10) 29°26'15.00"S 23° 2'18.84"E
Area 11) 29°26'20.35"S 23° 2'46.49"E
Area 12) 29°26'40.20"S 23° 2'46.21"E
Area 13) 29°26'49.01"S 23° 2'56.25"E
Area 14) 29°26'39.66"S 23° 3'15.76"E
Area 15) 29°26'10.53"S 23° 3'4.04"E
Area 16) 29°27'13.09"S 23° 2'56.24"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 15**). 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 northeast 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 plant fossils associated with Dwyka Group sediments; Late Neogene vertebrate fossils associated with intact river terrace gravels; Quaternary vertebrate fossils associated with Pleistocene alluvial deposits.

The Mbizane Formation is not considered to be highly fosilliferous, 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) (**Fig 16**). 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. 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. 17**), 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 around Prieska, including Kleindoring, Wonderdraai and Omdraaisvlei. 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. Further away, prehistoric graves and clay pottery have been recorded along the Orange River south of Douglas. Before the town of Prieska was founded 1882, early travellers 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 towards Prieska (**Fig. 18**). 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). No Iron Age sites are expected to be found in this area as it falls outside the southwestern periphery of distribution of Iron Age settlement in the region (Humphreys 1976, **Fig. 18**).

Field Assessment

The affected areas are generally located on superficial deposits resting on 40-60 m river terrace gravels (Neogene Period) and Mbizane Formation conglomerates (Palaeozoic Era).

Areas 1 – 4, 6 & 7

The study areas are capped by a geologically recent ~15 m alluvial overburden, as well as occasional pockets of well - developed Quaternary sand (*Qs*) (**Fig. 19**). No fossils or potential fossil exposures were observed within superficial sediments. There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as surface scatters on the landscape within the boundaries of the proposed development footprints. 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.

Areas 5, 8, 9, 14 & 15

The study areas are capped by bedrock – derived surface gravels, surface limestones / reworked calcretes (*T-Qc*), and well - developed Quaternary sand deposits (*Qs*), abutting 60 m Neogene terrace. No fossils or potential fossil exposures were observed within superficial sediments. Low density scatters of locally derived and mostly weathered stone tools are found scattered in Area 5 (GPS coordinates 29°25'55.01"S 23° 5'47.56"E) and Area 8 (GPS coordinates 29°25'50.92"S 23° 2'47.21"E) (**Fig. 20 & 21**). However, there is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as surface scatters on the landscape. 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.

Areas 10 – 12 & 16

The study areas are capped by well - developed Quaternary sand deposits (*Qs*). No fossils or potential fossil exposures were observed within superficial sediments. There is no evidence of *in situ* Stone Age archaeological material, either as capped assemblages or distributed as surface scatters on the landscape within the boundaries of the proposed development footprints. 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 pivot developments will largely impact geologically recent and well-developed superficial overburden. Surface limestones (*T-Qc*) and geologically recent aeolian sand overburden (Qs) in the region are generally not considered to be fossiliferous in the absence of intact (Neogene) terrace gravels, pans, springs, and pre-Holocene alluvial exposures. Areas 1, 4, 10, 11, 12 and part of 5 have been degraded by previous agricultural activities. 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, visible evidence of Stone Age/Prehistoric presence at two out of 16 areas is considered minor in terms of overall impact. The low-density, *ex situ* stone tool component observed in Areas 5 and 8 has been mapped and recorded. All the areas 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.

Archaeological Chance Finds Protocol for Developer

Any subsurface evidence of archaeological sites or remains (e.g. stone tool artifacts, bone or ostrich eggshell fragments, charcoal and ash heaps, or remnants of stone-made structures or unmarked graves) found during construction phase of development, must be reported to the SAHRA APM Unit (Tel. 021 462 5402).

- In the meantime, *potential archaeological structures such as stone-build enclosures, buildings or graves* must be avoided by a no-go buffer zone until further confirmation by the archaeologist. Smaller *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.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit must be alerted immediately. A professional archaeologist must be contracted as soon as possible to inspect the findings.
- If newly discovered heritage resources prove to be of archaeological significance, a Phase 2 rescue operation may be required, subject to permits issued by SAHRA

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DECLARATION OF INDEPENDENCE

Paleo Field Services act as an independent specialist consultant and do not 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. 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 impact	Confidence	Mitigation	Rating
Impact of proposed development on palaeontological heritage	Local	Permanent	Low; Sterile superficial deposits (T-Qc, Qs, allivium)	High	Phase 1 Evaluation	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	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

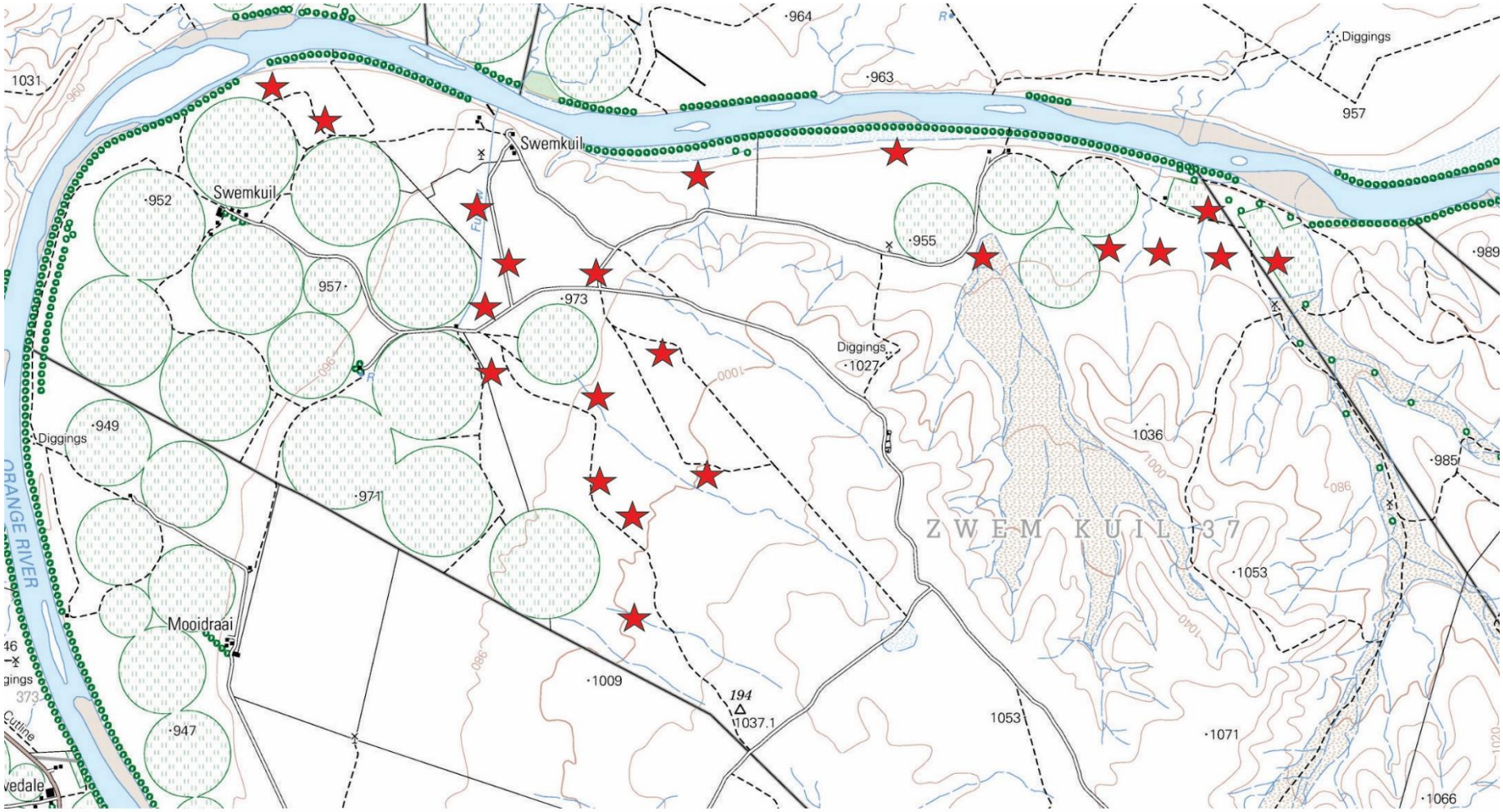

Figure 1. Map of the proposed agricultural developments (stars) on farm Zwemkiul (portion of 1:50 000 topographic map 2923AC Nuwejaarskraal)

Figure 2. Aerial view of proposed development footprints.

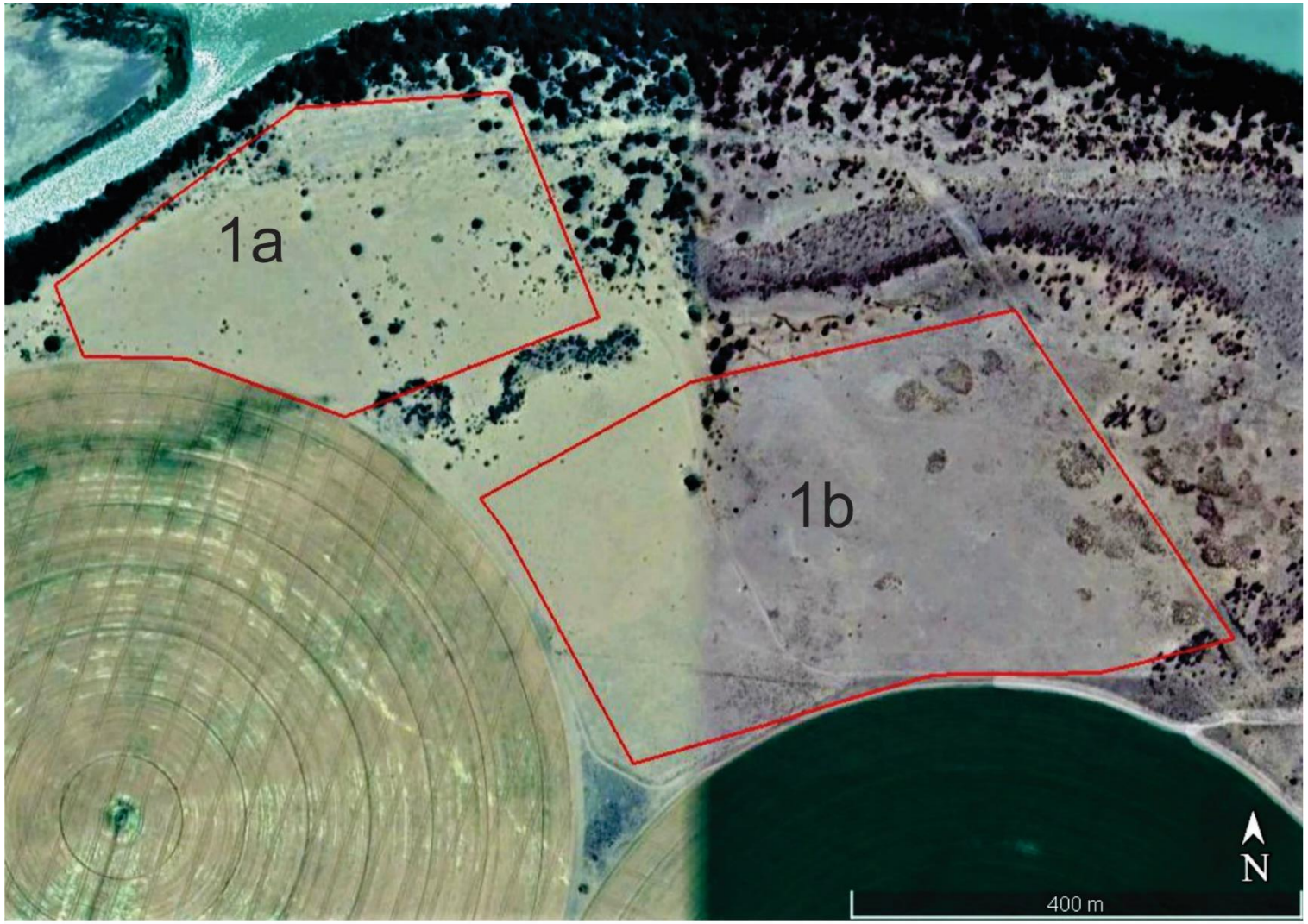

Figure 3. Layout of Area 1.

Figure 4. General view of Area 1a, looking west, north & east (top & center) and 1b, looking west (bottom).

Figure 5. Layout of Areas 2, 3 & 7

Figure 6. General view of Area 2, looking north (above left) Area 3, looking northeast (above right) and Area 7, looking south (below left) and north (below right).

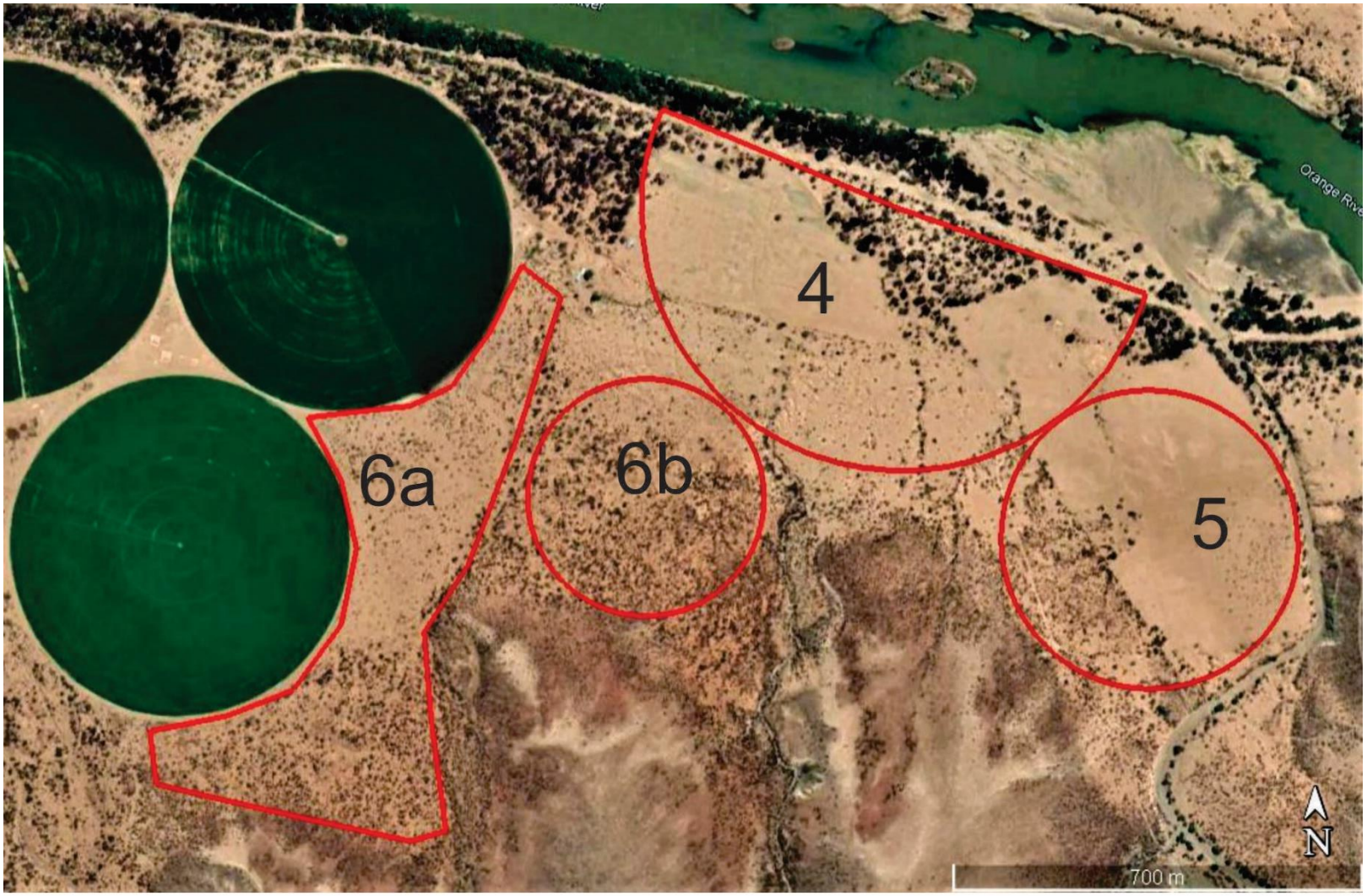

Figure 7. Layout of Areas 6, 5 & 6.

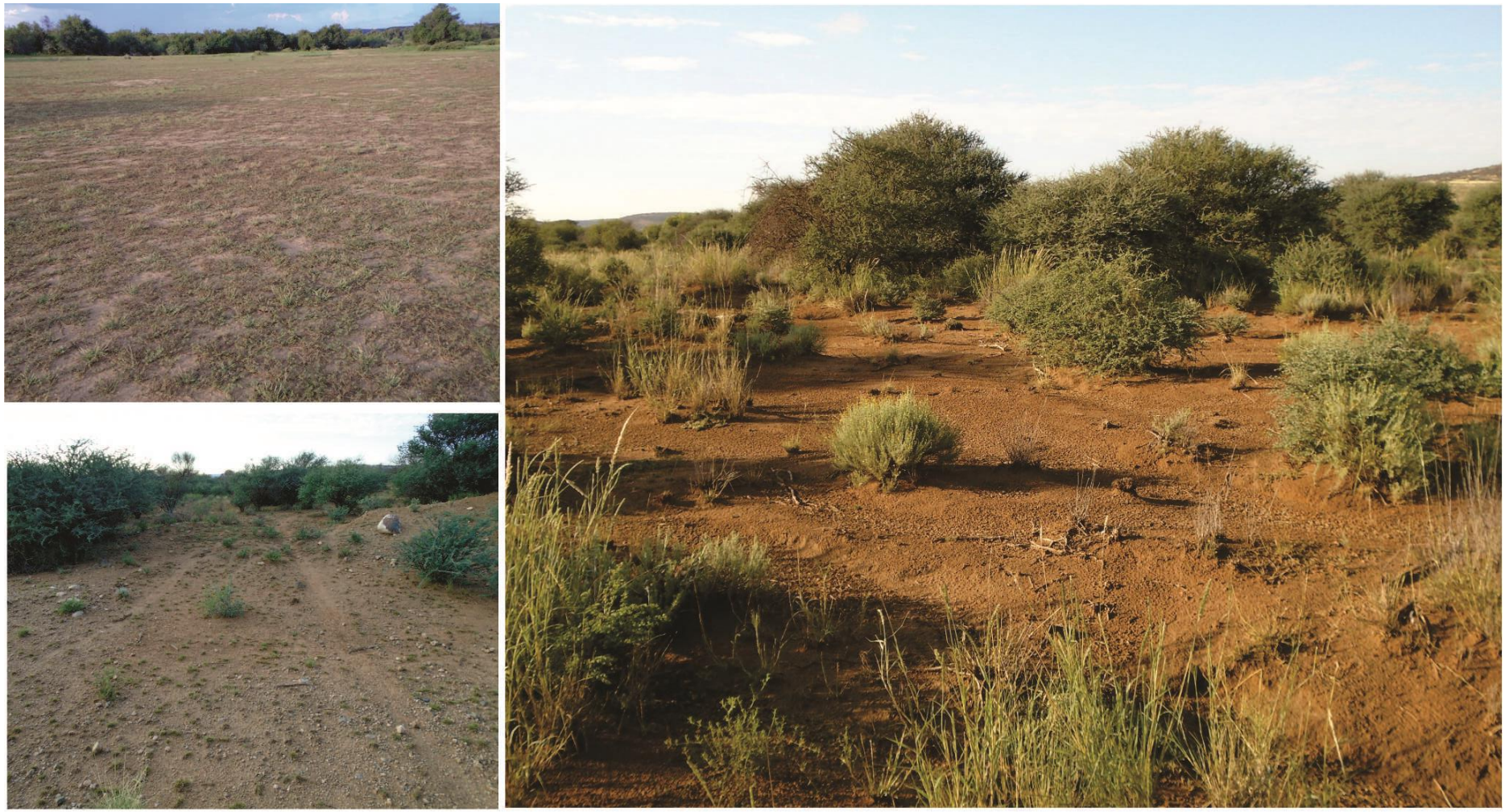

Figure 8. General view of Area 4, looking northeast (above left), Area 5, looking south (below left) and Area 6b, looking east (right).

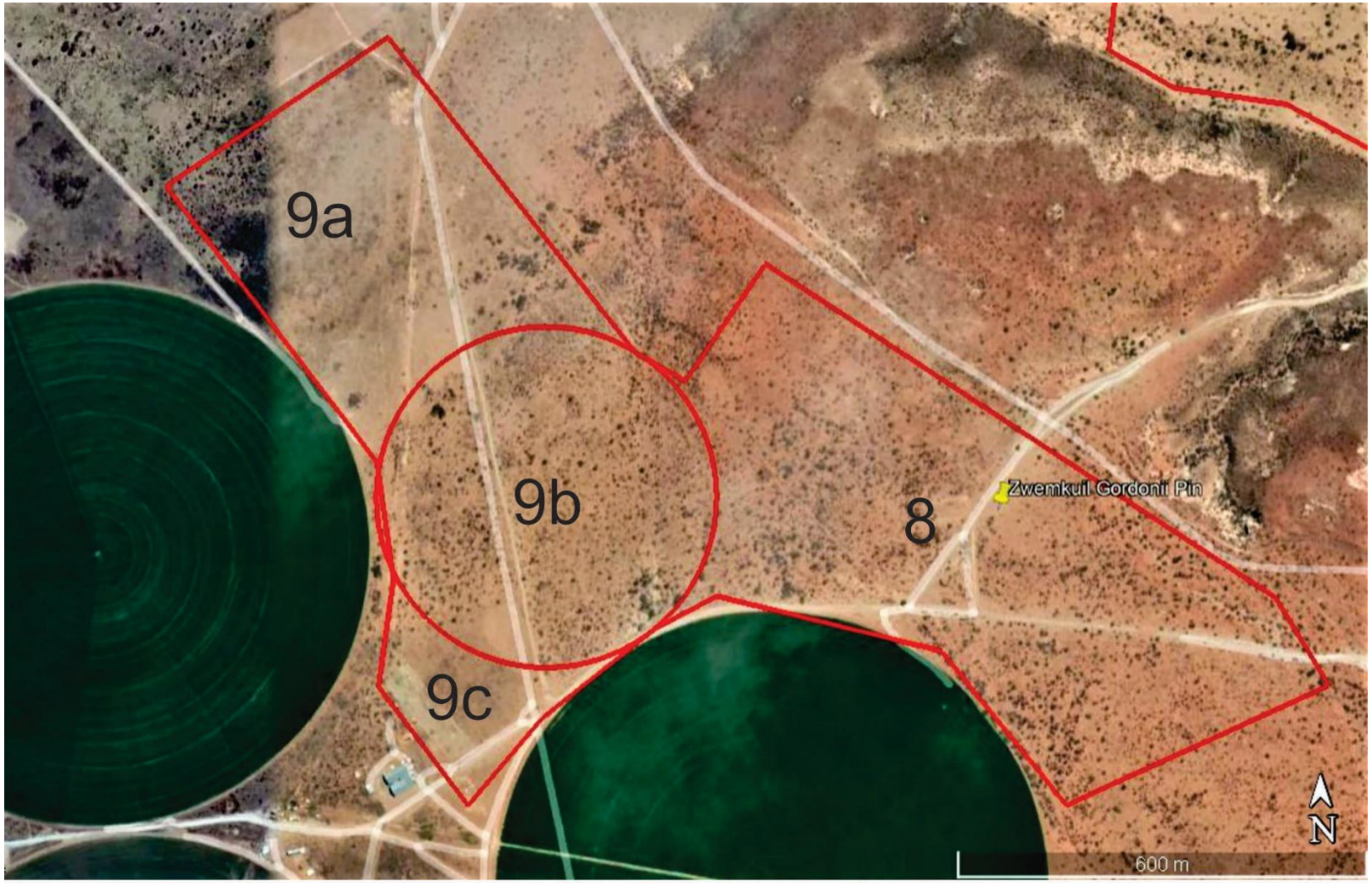

Figure 9. Layout of Areas 8 & 9.

Figure 10. General view of Area 8, looking east & west (above) and Area 9, looking west & south (below).
Scale 1 = 10 cm.

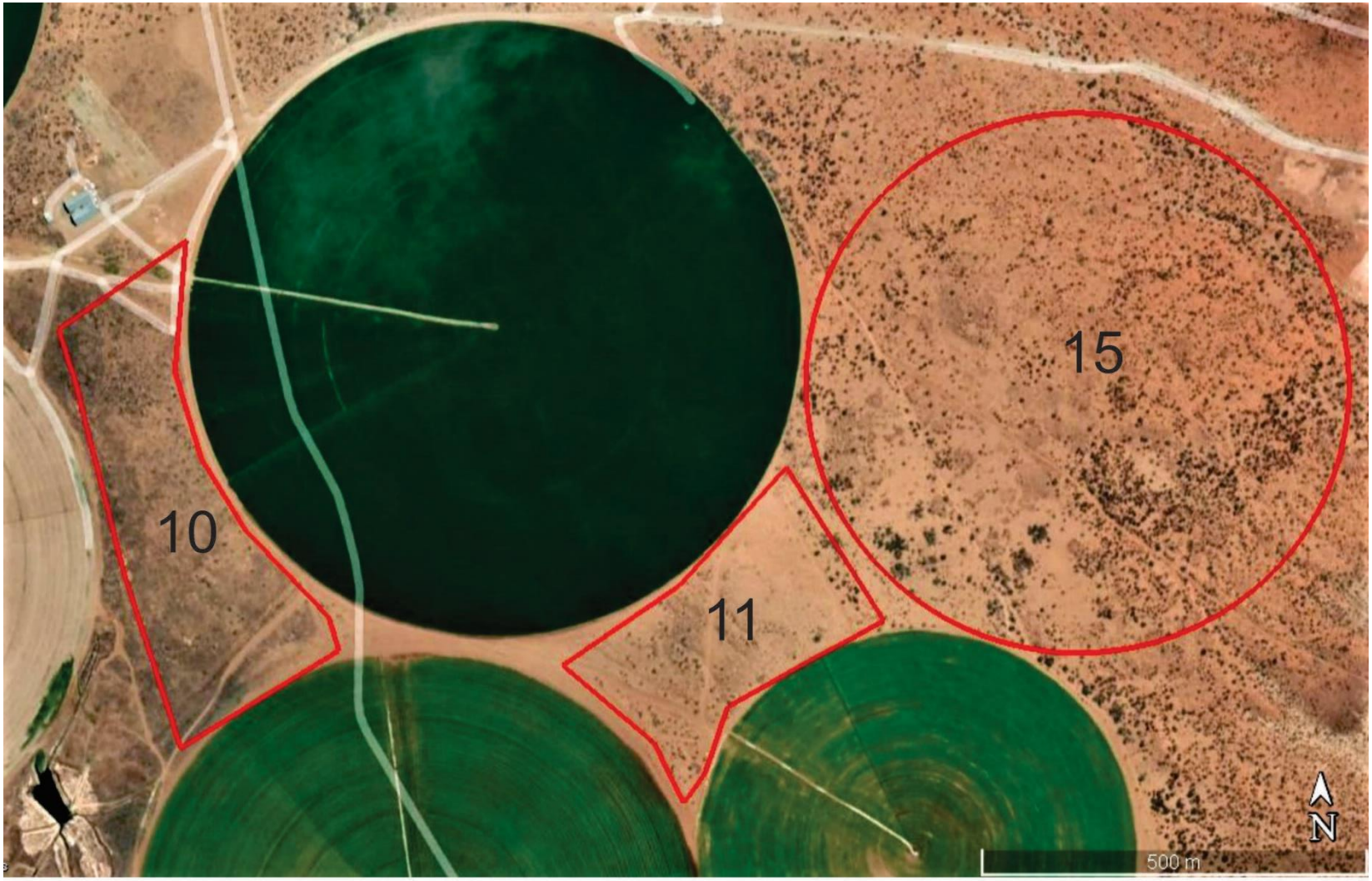

Figure 11. Layout of Areas 10, 11 & 15.

Figure 12. General view of Areas 10, looking west (above left), Area 11, looking southwest (below left) and Area 15, looking northeast (right).
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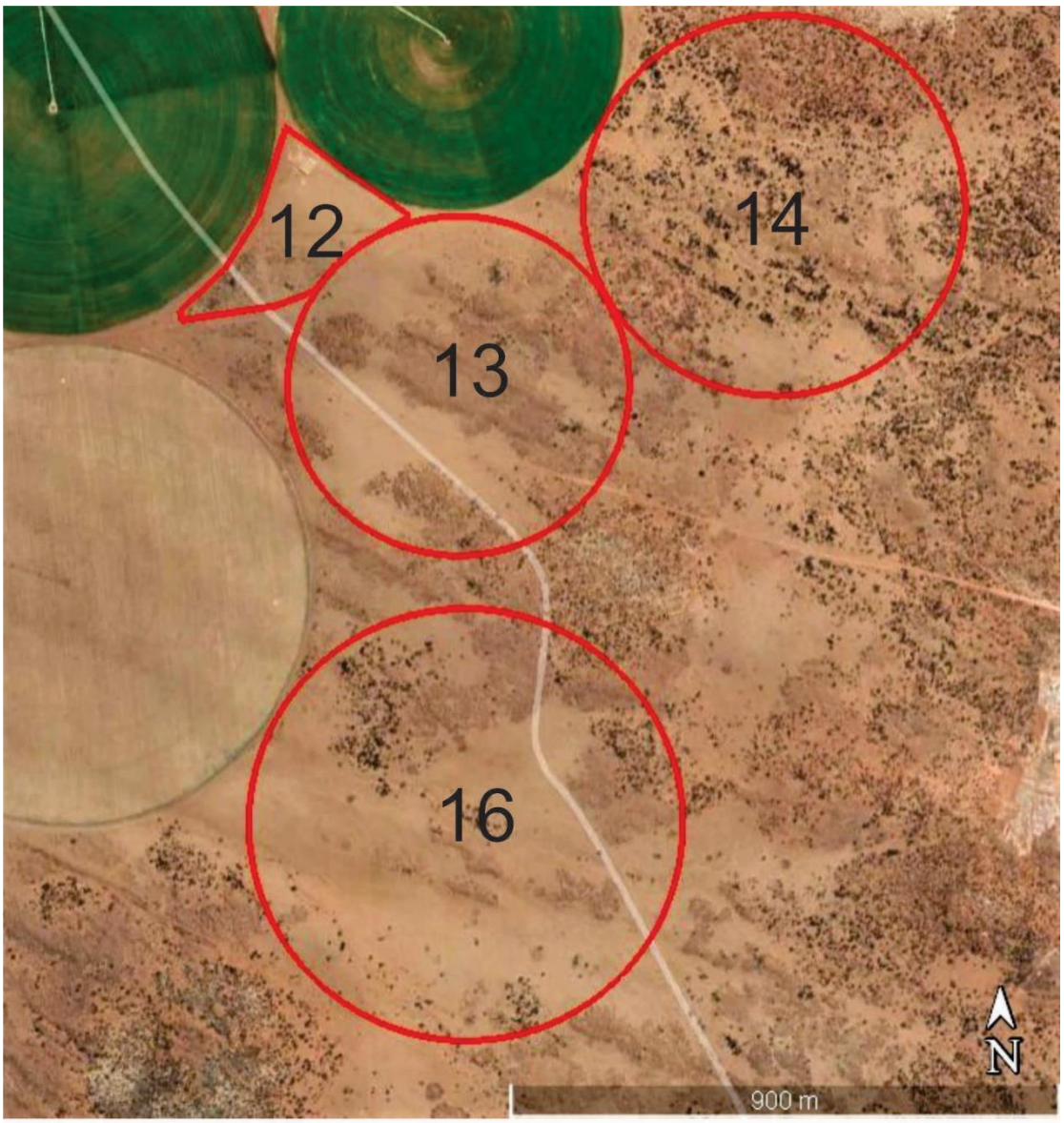


Figure 13. Layout of Areas 12 - 14 & 16.

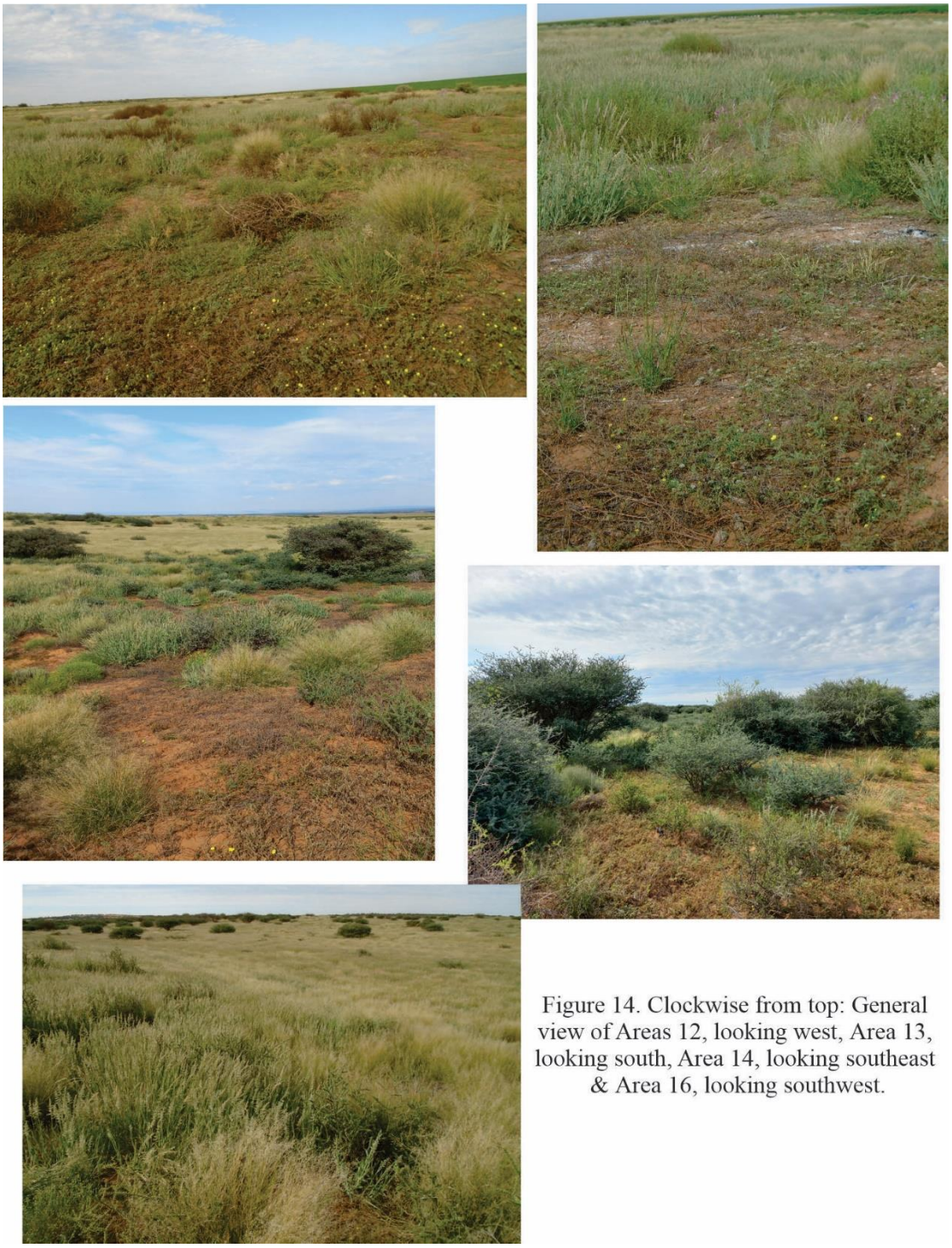
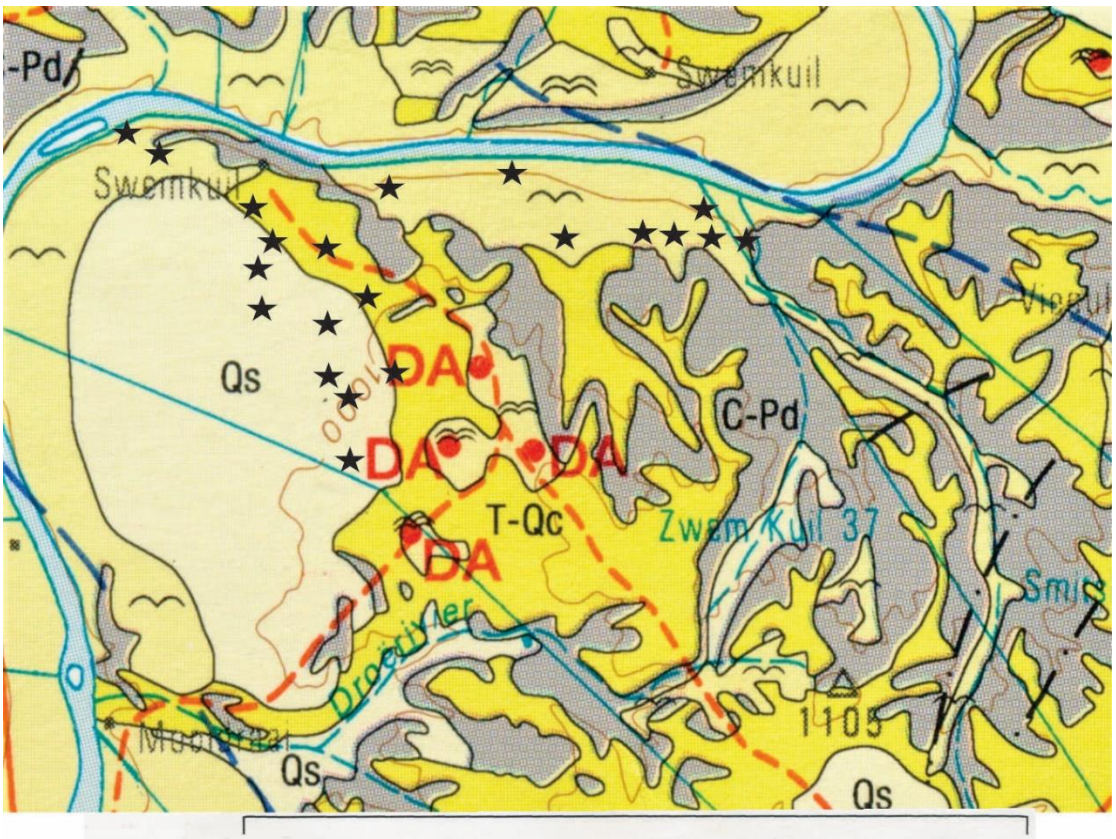


Figure 14. Clockwise from top: General view of Areas 12, looking west, Area 13, looking south, Area 14, looking southeast & Area 16, looking southwest.



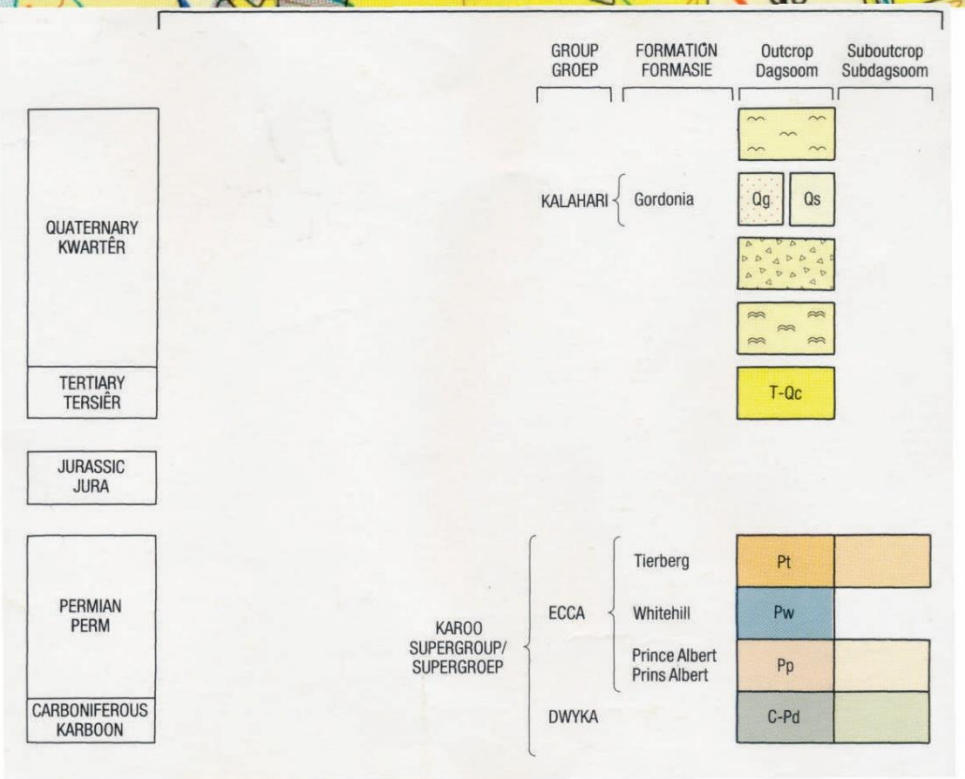


Figure 15. According to the 1: 250 000 scale geological map 2922 Prieska, the study area is underlain by glacially-related sediments of the Mbizane Formation (*C-Pd*; Dwyka Group, Karoo Supergroup). Superficial deposits are primarily represented by late Tertiary surface limestones (T-Qc), windblown Kalahari Group sand (Qs), surface gravels and alluvium.

Figure 16. Proposed development footprints (stars) marked on SAHRIS palaeosensitivity map (Sahris 2022)

Fig 17. Uncapped Stone Age surface scatters previously recorded along the Orange River between Douglas and Prieska (farms Marksdrift, Brakfontein, Nuwejaarsspruit and Kliphuis). ESA handaxe (above left), MSA parallel flake blade (above right), MSA Levallois core (below left & center) and LSA radial core (below right).

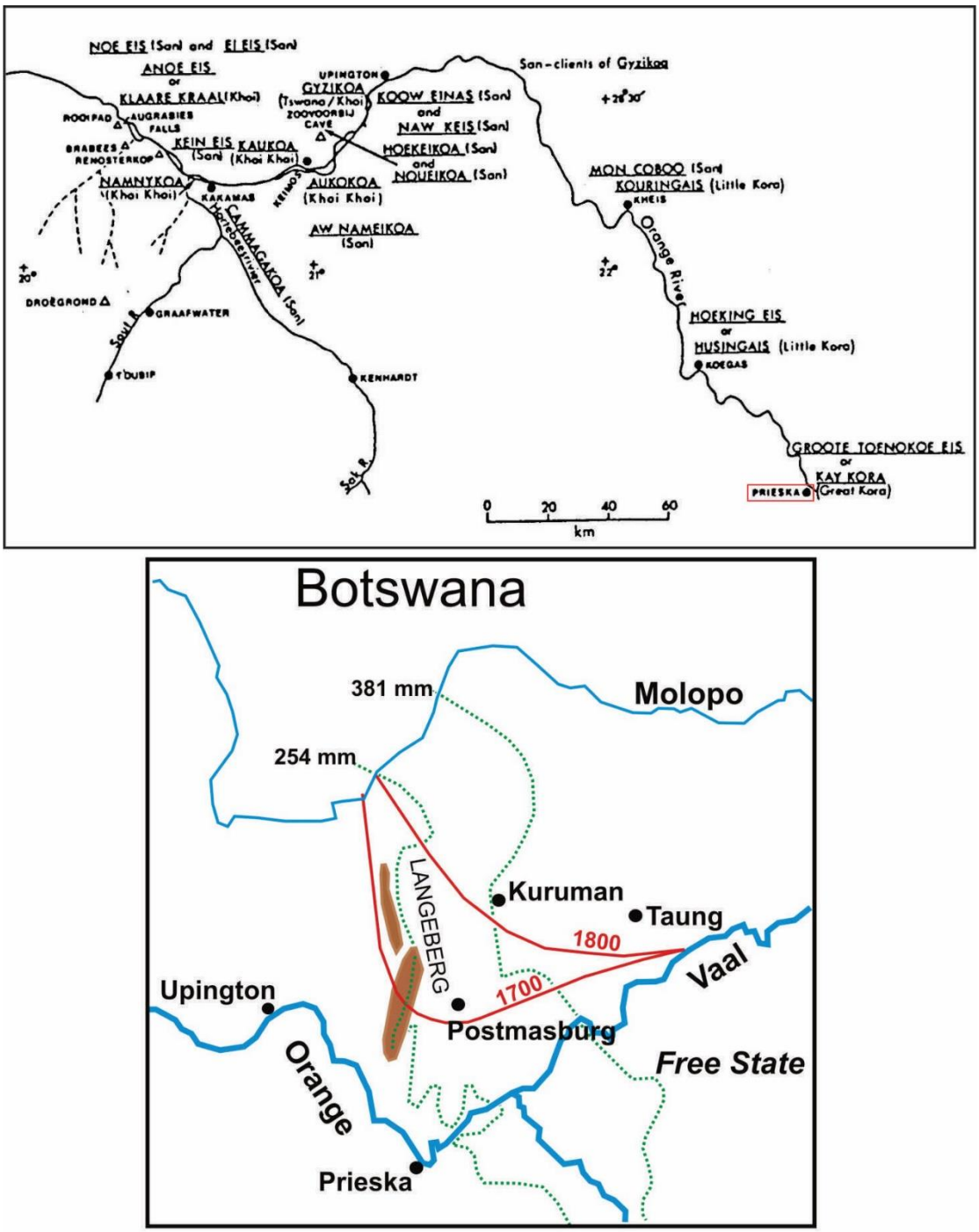


Figure 18. Distribution of Khoisan communities during the 18th century between Prieska and Kakamas (after Penn 1995) and southern limits of Tswana settlement during the 18th and 19th centuries (after Humphreys 1976).

Figure 19. Area 1 (top left) 40 m terrace & cutting above Area 2 & 3 (top center & top right), Area 2 (center left), Area 3 (center middle), Area 6 (center right) and Area 7 (bottom left). Scale 1 = 10 cm.

Figure 20. Localized calcretes (left) and stone tool surface occurences, Area 5.
Scale 1 = 10 cm.

Figure 21. Area 8: sandy substrate with surface gravels and limestone (left & center), MSA core and notched flake (above & below right).
Scale 1 = 10 cm.