

Phase 1 HIA for the development of a new irrigation pivot on
portion 34 of the Farm Doorns No. 131 near Ritchie, NC
Province.

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Summary

The report is a Phase 1 assessment of potential palaeontological and archaeological impact with regard to the proposed development of a 34 ha irrigation pivot on portion 34 of the Farm Doorns No. 131 near the town of Ritchie in the Northern Cape Province. The proposed development footprint including both the pipeline and irrigation pivot areas are very small and will primarily impact on severely disturbed terrain (existing pivot and associated agricultural land) capped and buffered by well developed Quaternary aeolian sand on low relief terrain. There is no evidence of *in situ* Stone Age archaeological material, rock art, prehistoric structures, graves or historically significant structures older than 60 years within the demarcated footprint.

Very little possibility exists that objects of palaeontological, archaeological or historical significance may be uncovered during the course of the proposed development. Given the scale and location of the proposed development the site is not considered palaeontologically or archaeologically vulnerable and is assigned a site rating of Generally Protected C.

Introduction

The report is a Phase 1 assessment of potential palaeontological and archaeological impact with regard to the proposed development of a 34 ha irrigation pivot on portion 34 of the Farm Doorns No. 131 near the town of Ritchie in the Northern Cape Province (**Fig. 1**). The majority of the assessment area is situated on an existing centre pivot footprint whilst only the north-eastern portion is situated on natural virgin soil. An irrigation pipeline required for the centre pivot land, will tie into the existing pump and piping network which is used for irrigation of other centre pivot lands in the area (**Fig. 2 & 3**).

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 proposed activity. 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, 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).

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 (**Table 1**). 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 heritage 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 with a field assessment by means of a pedestrian survey and investigation of all exposed sections within the footprint. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes.

Site significance classification standards prescribed by SAHRA (2005) were used to indicate overall significance and mitigation procedures where relevant (**Table 2**). There were no limitations or restrictions with regard to access to the site.

The task also involved identification and assessment of possible palaeontological and archaeological heritage within the proposed project area, taking into account 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.

Locality Data

Maps: 1:50 000 topographical map 2924 BA Modderrivier

1:250 000 geological map 2924 Koffiefontein

Centroid Coordinates: 29° 1'19.06"S 24°37'8.63"E

The proposed project area is approximately 34 ha in surface size and is situated on the Remaining extent of Farm Doorns 131 extending approximately 386 ha. The farm is located approximately 1800 m east of the town of Ritchie. (**Fig. 1**).

Background

Geology

The geology of the region has been described by Bosch (1993). The area in question is underlain by sediments of widely different geological ages (**Fig. 4**, portion of 1: 250 000 scale geological map 2924 Koffiefontein, Council for Geoscience, Pretoria). From oldest to youngest, the geology in and around the affected area is made up of Ventersdorp Supergroup lavas (andesites), Permian Ecca shales (*Ppr*, Prince Albert Formation located at the base of the Ecca Group, Karoo Supergroup), Jurassic dolerite intrusions (*Jd*, Karoo Dolerite Suite), Quaternary calcretes, surface limestones, calcified pandunes (*Qc*) and aeolian sands (*Qs*, Kalahari Group).

Karoo Fossils

Fossil-bearing, laminated basinal mudrocks of the Prince Albert Formation from the lowermost Ecca Group (*Ppw*) have been recorded near Douglas, containing petrified wood, invertebrates, fish, coprolites and palynomorphs from calcareous concretions (McLachlan and Anderson 1973, Visser *et al.*, 1977-78).

Dolerites

Dolerite, in the form of dykes and sills, is common throughout the region. Regarded as feeders of Drakensberg lavas, dolerites are not palaeontologically significant and can be excluded from further consideration in the present evaluation. On the other hand, dolerite outcrop can be regarded as archaeologically significant since Stone Age lithic artifacts in the region are mostly made of hornfels, a fine-grained isotropic rock found in the hot-contact zone between the dolerites and shales in the area. As a result, stone tool factory sites are commonly found near dolerite-shale contact zones. In addition, rock engravings in the region are consistently found on dolerite.

Late Cenozoic Deposits

The occurrence of Plio-Pleistocene fossil remains is largely restricted to the alluvial gravel terraces of the Vaal River northeast of Kimberly and overbank sediments of the Modder and Riet Rivers situated to the east (Cooke 1949; Maglio and Cooke 1978; Partridge and Maud 2000; Churchill *et al.* 2001; Rossouw 2006). Gravel terraces of the Vaal River contain sandy lenses that have yielded a variety of extinct vertebrate taxa.

Stone Age Archaeology

The heritage footprint in the region around Kimberley is primarily represented by Stone Age sites and assemblages, either capped or occurring as surface occurrences, rock engraving sites, glacial pavements and structural remnants dating back to the Kimberley Diamond Rush of the 1870's and the Anglo Boer War. The early exploitation of the Vaal River Gravels by diamond diggers and the resulting development of infrastructure in the region exposed a wealth of archaeological sites that contributed to the development of prehistoric archaeology in southern Africa (Sohnge *et al.* 1937; Helgren 1979; Beaumont and Morris 1990; Forssman *et al.* 2010) (**Fig. 5**). As a result, Stone Age archaeological sites in the region are generally associated with, and mostly restricted to a variety of lacustrine contexts as

well as the alluvial gravel terraces of the Vaal River. Some important sites located within 40 km of study area include

- an abundance of Fauresmith and Acheulian artifact assemblages found in an andesite cobble and worn exotics matrix capped by a thick layer of red sand at Nooitgedacht near The Bend on the Vaal;
- an abundance of Acheulian artifact assemblages found in thick calcrete deposits at Doornlaagte (a declared national monument), some 20 km east of Schmidtsdrif.
- the famous Nooitgedacht Glacial Pavements situated near the banks of the Vaal River consisting of multiple striations on amygdaloidal Ventersdorp andesite that was produced by an ice age that commenced in early Carboniferous times. In addition to the glacial striations the site is also known for its rock engravings (**Fig. 6**). Rock engraving sites associated with dolerite outcrop are also common around Kimberley (e.g. Wildebeestkuil).
- ESA and MSA stone tools uncovered during mining operations between 1930 and 1955 at Pniel (Powers Site) near Nooitgedacht (**Fig. 7**).
- Canteen Koppie, which is the location of the first alluvial diamond diggings in South Africa that continued up until the 1920's. Proclaimed a National Monument in 1948, the alluvial gravels capping the underlying bedrock at the site has yielded a wealth of ESA stone tools while MSA lithics have been recovered from within the layer of red sands overlying the terrain.
- A large number of *Fauresmith* bifaces occur *in situ* within Quaternary-age surface deposits at Kromrand, 22 km southwest of Boshof (**Fig. 8 & 10**).

Historical Heritage

Major battles occurred between the British and Boer forces in late 1899 south of Kimberley (**Fig. 11 & 12**). In November 1899, British general Methuen successfully fought the Boers at Belmont, Graspan and Modder River south of Ritchie, while the Boers defeated the British forces at Magersfontein in December 1899 (Von der Heyde 2013).

Results

The proposed development footprint including both the pipeline and irrigation pivot areas are very small and will primarily impact on severely disturbed terrain (existing pivot and associated agricultural land) capped and buffered by well developed Quaternary aeolian sand on low relief terrain. There is no evidence of *in situ* Stone Age archaeological material, rock art, prehistoric structures, graves or historically significant structures older than 60 years within the demarcated footprint.

Statement of Significance and Recommendations

Very little possibility exists that objects of palaeontological, archaeological or historical significance may be uncovered during the course of the proposed development. Given the scale and location of the proposed development the site is not considered palaeontologically or archaeologically vulnerable and is assigned a site rating of Generally Protected C (**Table 2**).

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 and have no interest in secondary or downstream developments as a result of the authorization of this project.

Yours truly,

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

27 / 11 / 2018

Tables and Figures

Table 1: Relationship between different heritage contexts, examples of heritage resources likely to occur within these contexts, and likely sources of heritage impacts in the central interior of South Africa.

Heritage Context	Heritage Resources	Impact
Palaeontology	e.g. Precambrian shallow marine and lacustrine stromatolites, organic-walled microfossils, Ghaap Plateau (Transvaal Supergroup) Neogene regolith, Vaal River gravels, pan dune sediments	Road cuttings Quarry excavation Bridge and pipeline construction (Quaternary alluvial deposits)
Archaeology Early Stone Age Middle Stone Age LSA - Herder Historical	Types of sites that could occur in the Northern Cape include: Localized Stone Age sites containing lithic artifacts, animal and human remains found near <i>inter alia</i> the following: River courses/springs Stone tool making sites Cave sites and rock shelters Freshwater shell middens Ancient, kraals and stonewalled complexes Abandoned areas of past human settlement Burials over 100 years old Historical middens Structural remains Objects including industrial machinery and aircraft	Subsurface excavations including ground levelling, landscaping, foundation preparation, road building, bridge building, pipeline construction, construction of electrical infrastructure and alternative energy facilities, township development.
History	Historical townscapes, e.g. Kimberley Historical structures, i.e. older than 60 years Historical burial sites Places associated with social identity/displacement, Oppermansgronde Historical mission settlements, e.g. Pella, Moffat Mission	Demolition or alteration work. New development.
Natural Landscapes	Formally proclaimed nature reserves Evidence of pre-colonial occupation Scenic resources, e.g. view corridors, viewing sites, Historical structures/settlements older than 60 years Geological sites of cultural significance.	Demolition or alteration work. New development.
Relic Landscape Context	Battle and military sites, e.g. Magersfontein Precolonial settlement and burial sites Historical graves (marked or unmarked, known or unknown) Human remains (older than 100 years) Associated burial goods (older than 100 years) Burial architecture (older than 60 years)	Demolition or alteration work. New development.

Table 2. Site 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

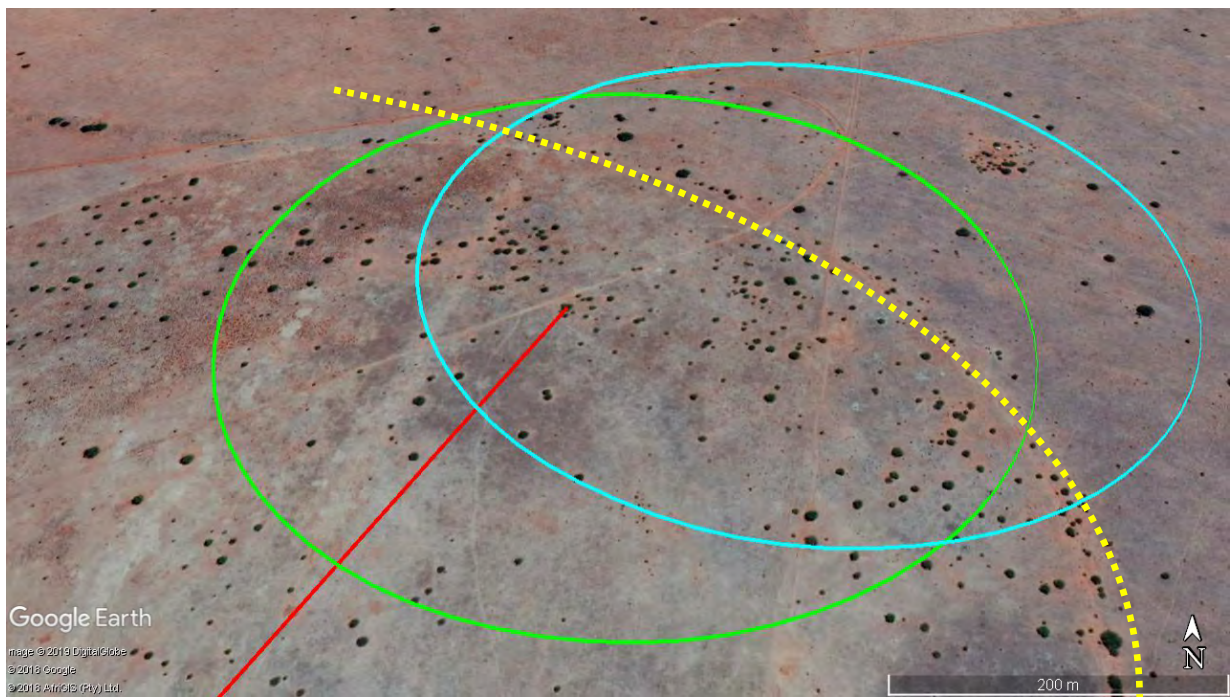
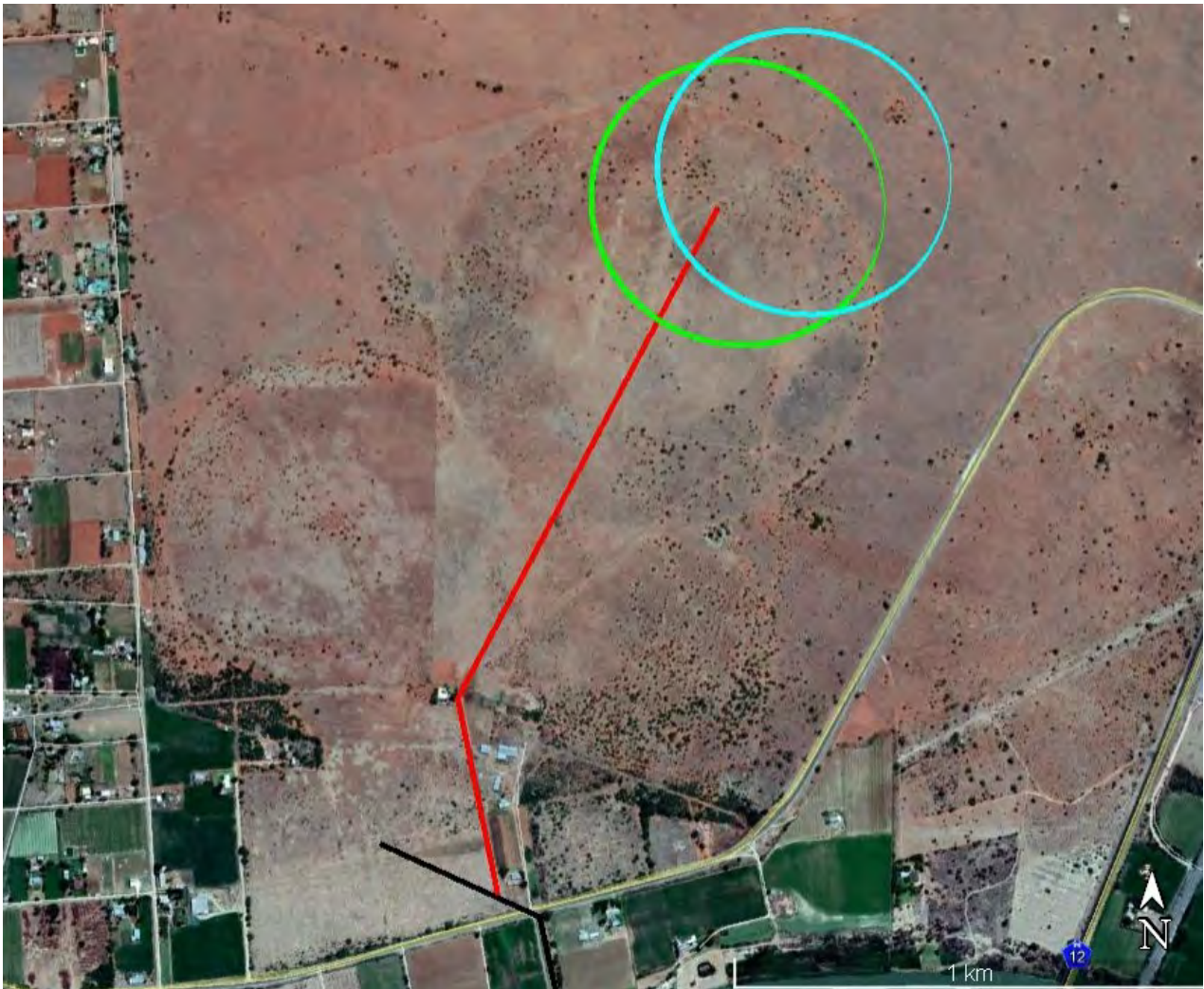


Figure 1. Aerial view of the site including proposed pipeline and both alternatives (above) partially located on old irrigation pivot indicated by stippled yellow line (below).



Figure 2. General view of the site, looking north (above) and south (below).



Figure 3. General view of the site, looking east.

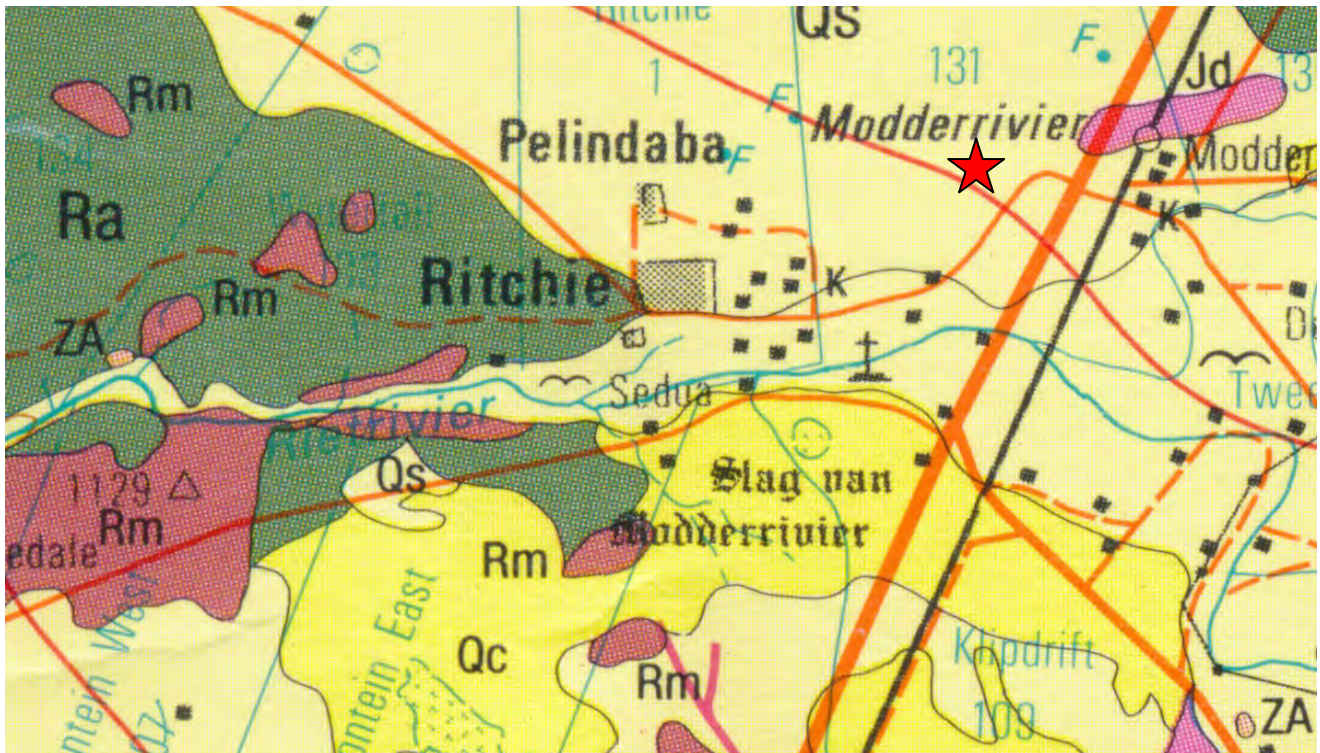


Figure 4. Portion of 1:250 000 scale geographical map 2924 Koffiefontein indicating position of the site (red star). From oldest to youngest, the geology in and around the affected area is made up of Ventersdorp Supergroup lavas (andesites, *Ra*), Permian Ecca shales (*Ppr*, Prince Albert Formation located at the base of the Ecca Group, Karoo Supergroup), Jurassic dolerite intrusions (*Jd*, Karoo Dolerite Suite), Quaternary calcretes, surface limestones, calcified pandunes (*Qc*) and aeolian sands (*Qs*, Kalahari Group).



1. Pniel, Nooitgedacht & Powers Site - ESA, MSA and LSA
2. Canteen Koppie - ESA
3. Rooddam - ESA
4. Biesiesput - MSA
5. Driekopseiland - Glacial striations, Rock engravings
6. Doornlaagte - ESA
7. Kareevloer - ESA, MSA
8. Alexandersfontein - 'palaeo-lake'
9. Liebensraum - ESA
10. Wildebeestkuil - Rock engravings
11. Witpan - Rock engravings
12. Orange River Station, Blockhouse & Concentration Camp - Anglo-Boer War
13. Battle of Magersfontein - Anglo-Boer War
14. Battle of Modder River - Anglo-Boer War
15. Graveyard - Anglo-Boer War
16. Fortifications - Anglo-Boer War
17. Beaconsfield historical landscape

Figure 5. Heritage sites in the vicinity of Kimberley.

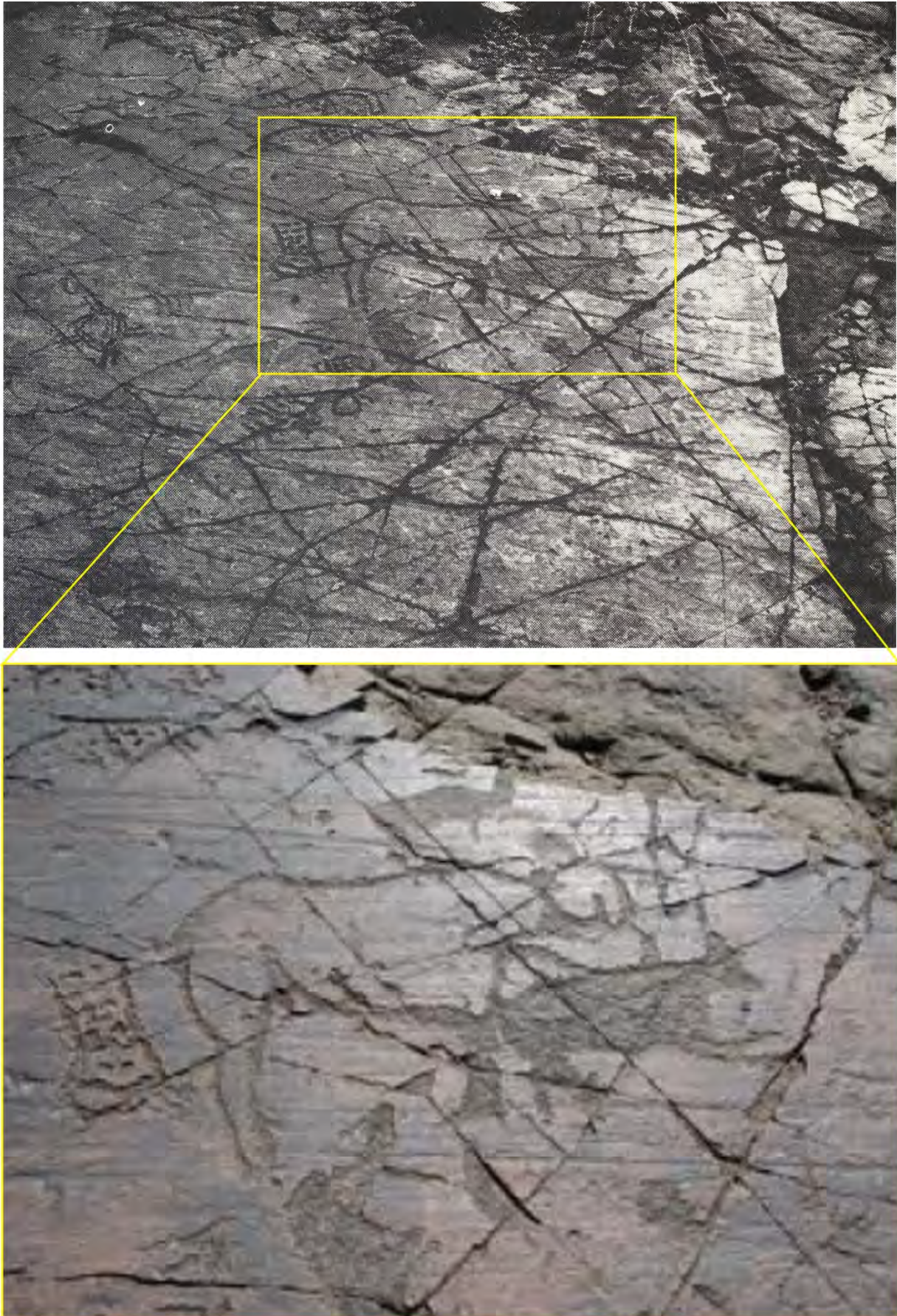


Figure 6. Example of rock engravings found on the glacial pavements at Nooitgedacht.

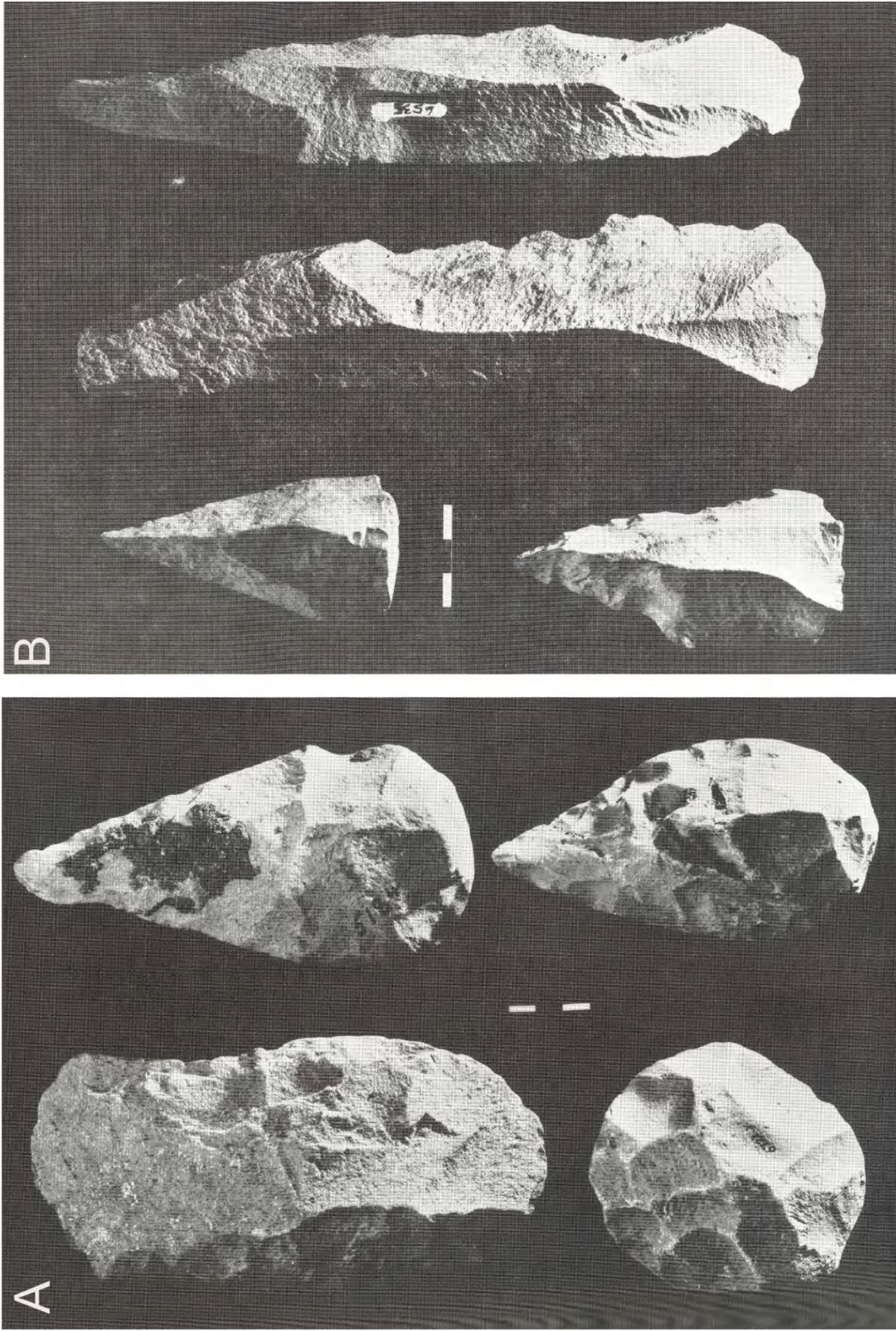


Figure 7. (A) Clockwise from left: a cleaver, 2 x handaxes and a prepared core; (B) Upper and lower left: convergent point; middle and right: parallel and convergent long blades. Raw material = andesite (after Beaumont & Morris 1990).



Figure 8. Surface scatters (left) and *in situ* ESA bifaces (right) at Kromrand, southwest of Boshof.

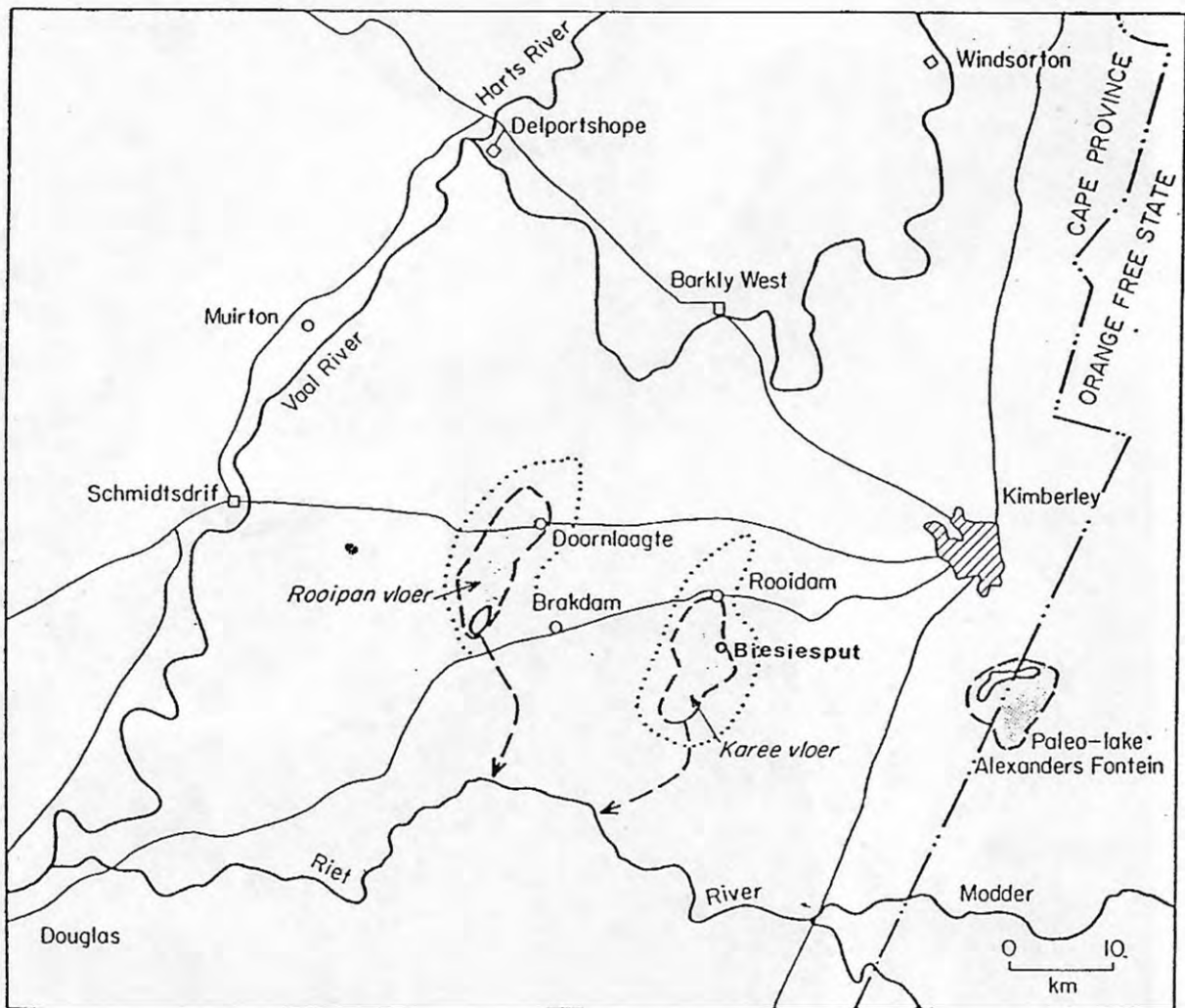


Figure 9. Map of area west of Kimberly, indicating the location of Doornlaagte 1.

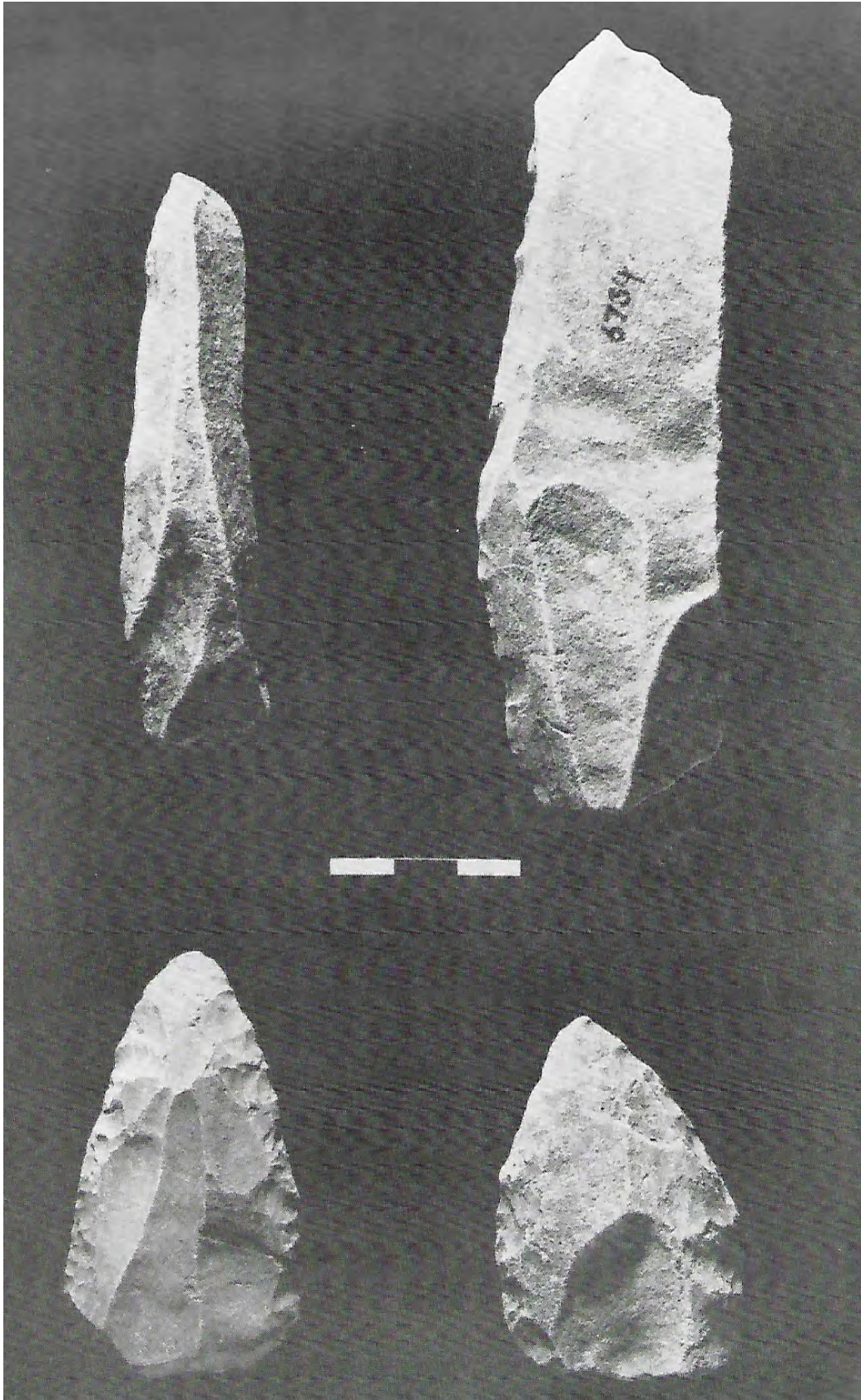


Figure 10. MSA unifacial points & parallelflake blades made from lydianite from Nooitgedacht Near Pniel on the Vaal River.

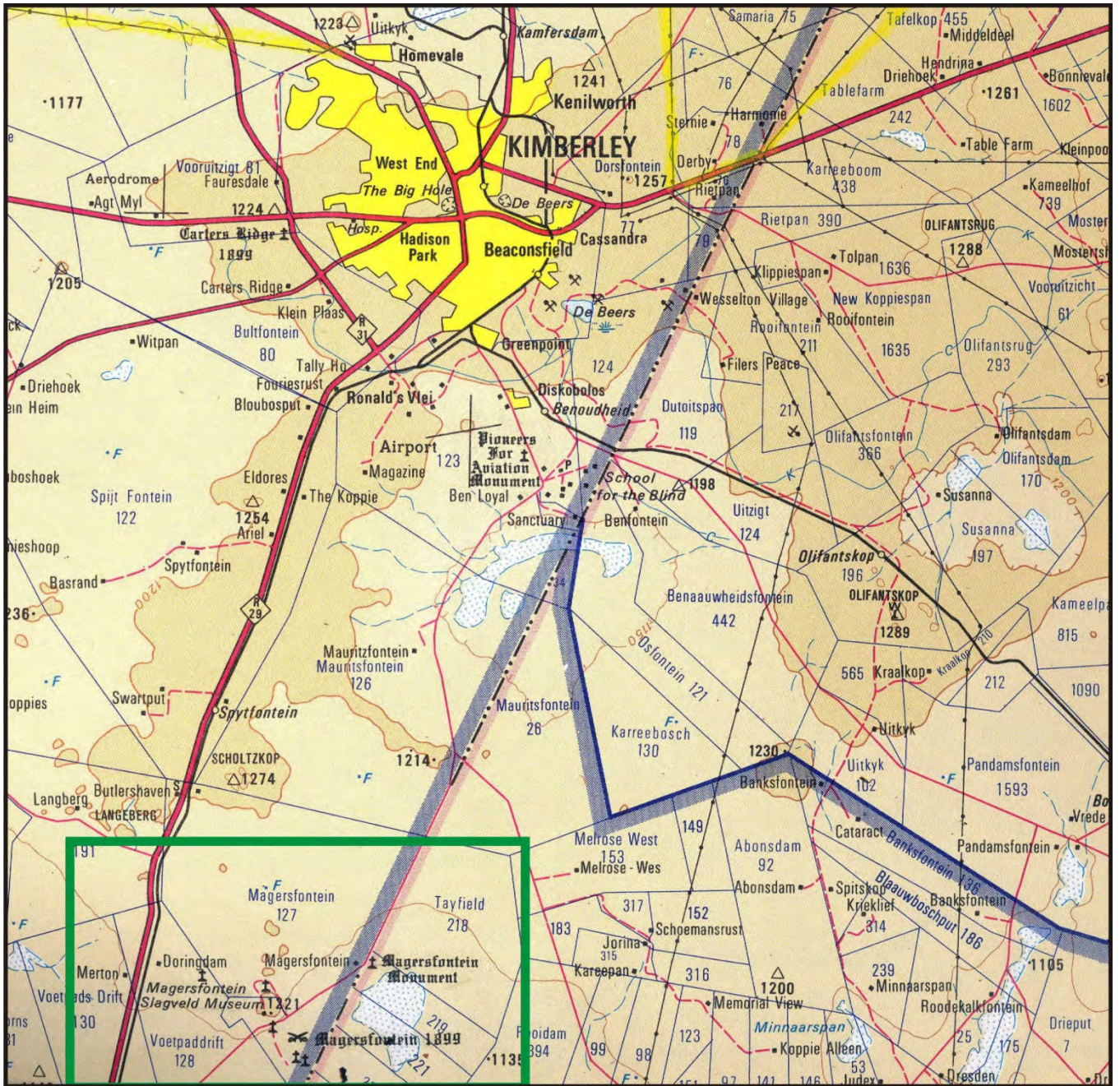


Figure 11. Portion of 1:250 000 scale topo-cadastral map showing position of Kimberley in relation to the Magersfontein Battlefield terrain.

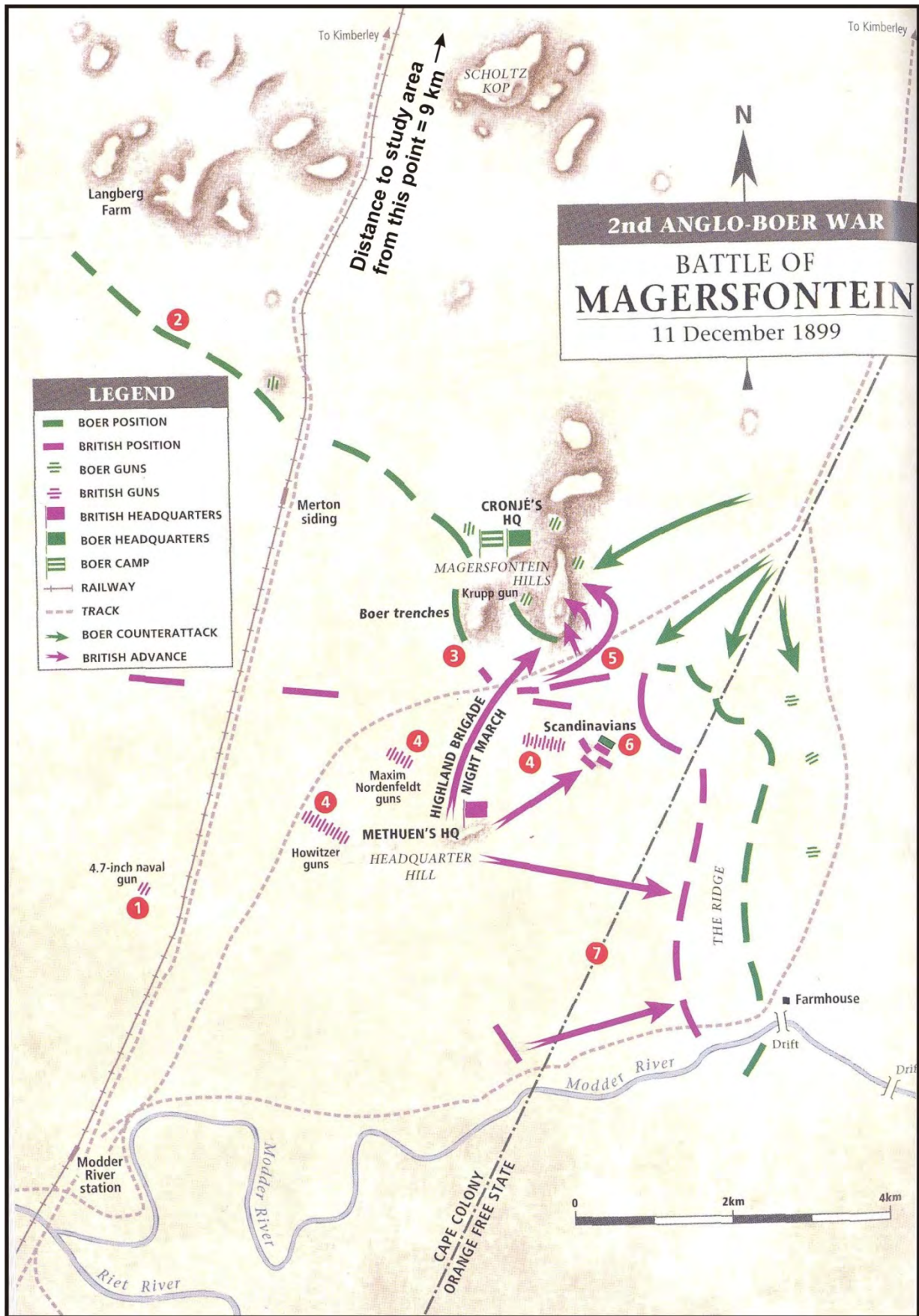


Figure 12. Plan of the Battle of Magersfontein.