

Phase 1 Heritage Impact Assessment of an existing
quarry on the farm Plooyfontein 93 near Hanover, NC
Province.



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Executive Summary

- At the request of EKO Environmental Consultants in Bloemfontein, a Phase 1 Heritage Impact Assessment was carried out at an existing dolerite quarry marked for expansion near Hanover in the Northern Cape province.
- The quarry is situated 600 m southeast of the N1 national road on the farm Plooyfontein 93, about 15 km south of Hanover. The affected area, including the existing quarry covers approximately 6ha and is situated on a large dolerite outcrop.
- The affected area is primarily underlain by palaeontologically insensitive dolerite bedrock covered by Quaternary-age surface deposits and residual soils (topsoils).
- There are no indications of prehistoric structures or rock engravings within the footprint area.
- There is also no evidence of graves, graveyards, historical structures older than 60 years or areas of cultural significance associated with oral histories within the confines of the study area.
- There is no evidence of intact or capped Stone Age archaeological material, stone tool knapping sites or Quaternary fossils within the confines of the footprint.
- Surface scatters of individual stone tools were recorded on Quaternary sediments along the northeast and southwest boundaries of the study area. The material largely represented by patinated and rolled flake blanks. No cores or formal tools were recorded.
- There are **no major archaeological or palaeontological grounds** to suspend the proposed development.

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Introduction

At the request of EKO Environmental Consultants in Bloemfontein, a Phase 1 Heritage Impact Assessment was carried out at an existing dolerite quarry marked for expansion on the farm Plooyfontein 93, 15 km south of Hanover in the Northern Cape 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 February 2014. 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.

Description of the Affected Area

Locality Data

1:50 000 topographical map 3124 AB Hanover

The quarry is situated 600 m southeast of the N1 national road on the farm Plooyfontein 93, about 15 km south of Hanover (**Figs. 2 and 3**). The affected area, including the existing quarry covers approximately 6ha and is situated on a large dolerite outcrop (**Fig. 4; Table 1**) which is flanked by an old drainage area to the northeast (**Fig. 5**). The existing quarry is not visible from the N1 national road (**Fig. 6**).

Geology

From oldest to youngest, the geology in and around the affected area is made up of Permian sandstones and mudstone layers of the Adelaide Subgroup (*Pa*, Beaufort Group) Jurassic dolerite intrusions (*Jd*, Karoo Dolerite Suite) Quaternary alluvial sediments and residual soil deposits (**Fig. 7**). The site itself is primarily underlain by dolerite bedrock and geologically recent alluvium and residual soils around its perimeter (**Figs. 8 and 9**)

Methodology

The baseline study involved a pedestrian survey of the area. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera, were used to

record relevant data. Relevant archaeological and palaeontological information were assimilated for the report and integrated with data acquired during the on-site inspection.

Background

Karoo Sedimentary Rocks

As part of the fossil-rich Beaufort Group strata, the Adelaide Subgroup rocks (*Pa*) in the region are regarded as highly sensitive with regards to palaeontological heritage. Regionally, it is assigned to the *Cistecephalus* Assemblage Zone (biostratigraphic zone) (Smith and Keyser 1995) (**Fig. 10**), which crops out continuously between Philippolis and Richmond (Kitching 1977). The *Cistecephalus* Assemblage Zone represents a variety of therapsid fauna and is characterized by the presence of *Cistecephalus*, *Aulacephalodon* and *Oudenodon*. Fossils in this biozone are mostly preserved in interchannel mudrocks and are usually found as isolated specimens (Smith and Keyser 1995). Other vertebrate fossils include fish, amphibians and amniotes, while plant fossils include *Glossopteris* and *Schizoneura*.

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. It is however moderately significant from an archaeological point of view as many Stone Age quarry sites (knapping sites) are found at the foot of dolerite hills where hornfels outcrop occur as a result of contact metamorphism following the intrusion of dykes and sills. Stone Age lithic artifacts in the region are mostly made of the fine-grained, isotropic hornfels. In addition, rock engravings in the region are consistently found on dolerite. Engraving sites have been recorded at the Hanover Town Commonage and at Groenfontein in the Hanover district and further west around Victoria West at Keurfontein, Leeuwfontein, Montana Wagenaarskraal and Wolwekop.

Late Cenozoic Deposits

Quaternary mammal fossil remains in the Karoo are relatively scarce, but fossils are known from well-preserved and unconsolidated alluvial and lacustrine sediments in the region, as for example, a horncore fragment of a large, extinct alcelaphine from alluvial sediments along the Ongers River north of Britstown (Brink *et al.* 1995).

There is currently no record of Quaternary mammal fossil remains found in the vicinity of the study area.

The Stone Age archaeological footprint in the upper Karoo is largely represented by the archaeological remains of Stone Age hunter gatherers and herders from cave shelters, pans and surface sites ((Goodwin and Van Riet Lowe 1929; Sampson 1985; Bousman 1991). Surface sites are represented by very old (Early and Middle Stone Age) to more recent (Later Stone Age) assemblages or localized individual finds. Uncapped stone tools are usually found along erosional gullies in the vicinity of rivers and streambeds or near dolerite outcrops.

The establishment of farms and subsequent historical structures in the region dates back to the 1840's while the remnants of the Anglo Boer War are represented by battle sites, graves and blockhouses.

Results of Survey

The affected area is primarily underlain by palaeontologically insensitive dolerite bedrock covered by Quaternary-age surface deposits and residual soils (topsoils) (**Figs. 11 – 14**). The terrain has been severely disturbed by quarrying activities (**Fig. 15**). There are no indications of prehistoric structures or rock engravings within the footprint area. There is also no evidence of graves, graveyards, historical structures older than 60 years or areas of cultural significance associated with oral histories within the confines of the study area.

There is no evidence of intact or capped Stone Age archaeological material, stone tool knapping sites or Quaternary fossils within the confines of the footprint. Stone tools found near the quarry during a previous specialist assessment (Dreyer 2010) could not be located during the current survey. However, a few surface scatters of individual stone tools were recorded on Quaternary sediments along the northeast and southwest boundaries of the study area (**Fig. 16**). The lithics are largely represented by patinated and rolled flake blanks. No cores or formal tools were recorded.

Statement of Significance

Potential impacts are summarized in **Table 2**. Potential impact within the footprint is confined to unfossiliferous Quaternary sediments (unconsolidated topsoils) and dolerite bedrock while impact on potentially intact Stone Age archaeological remains or Quaternary fossils is considered unlikely. The lithics recorded near the site are

uncapped and most likely out of context as a result of lateral as well as vertical (lag deposits) displacement over time.

It is unlikely that the quarry activities will impact on potentially fossil-bearing bedrock provided that no excavation activities are conducted outside the existing quarry area.

Recommendation

There are no major archaeological or palaeontological grounds to suspend the proposed development provided that mining activities are kept within the existing boundaries. The site has been sufficiently recorded, mapped and documented in terms of conditions necessary for a Phase 1 heritage impact assessment and can be accessed for development.

References

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List of Tables and Figures

Table 1. General coordinates of the area surveyed.

Loc.	Coordinates
A	31°10'2.59"S 24°19'40.39"E
B	31°10'3.79"S 24°19'42.49"E
C	31°10'9.31"S 24°19'46.42"E
D	31°10'5.07"S 24°19'52.42"E
E	31° 9'57.34"S 24°19'41.86"E
F	31° 9'58.93"S 24°19'38.46"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	Low-moderate	High (Stone Age sites; graves; historical structures)	Low	Low
Dolerite Suite, <i>Jd</i> (Jurassic)	Permanent	None	Low - Moderate (Stone Age knapping sites; rock engravings)	None	None
Mudstone, Sandstone; Adelaide Subgroup, <i>Pa</i> (Permian)	Permanent	High (<i>Cistecephalus</i> AZ)	None	Low	None

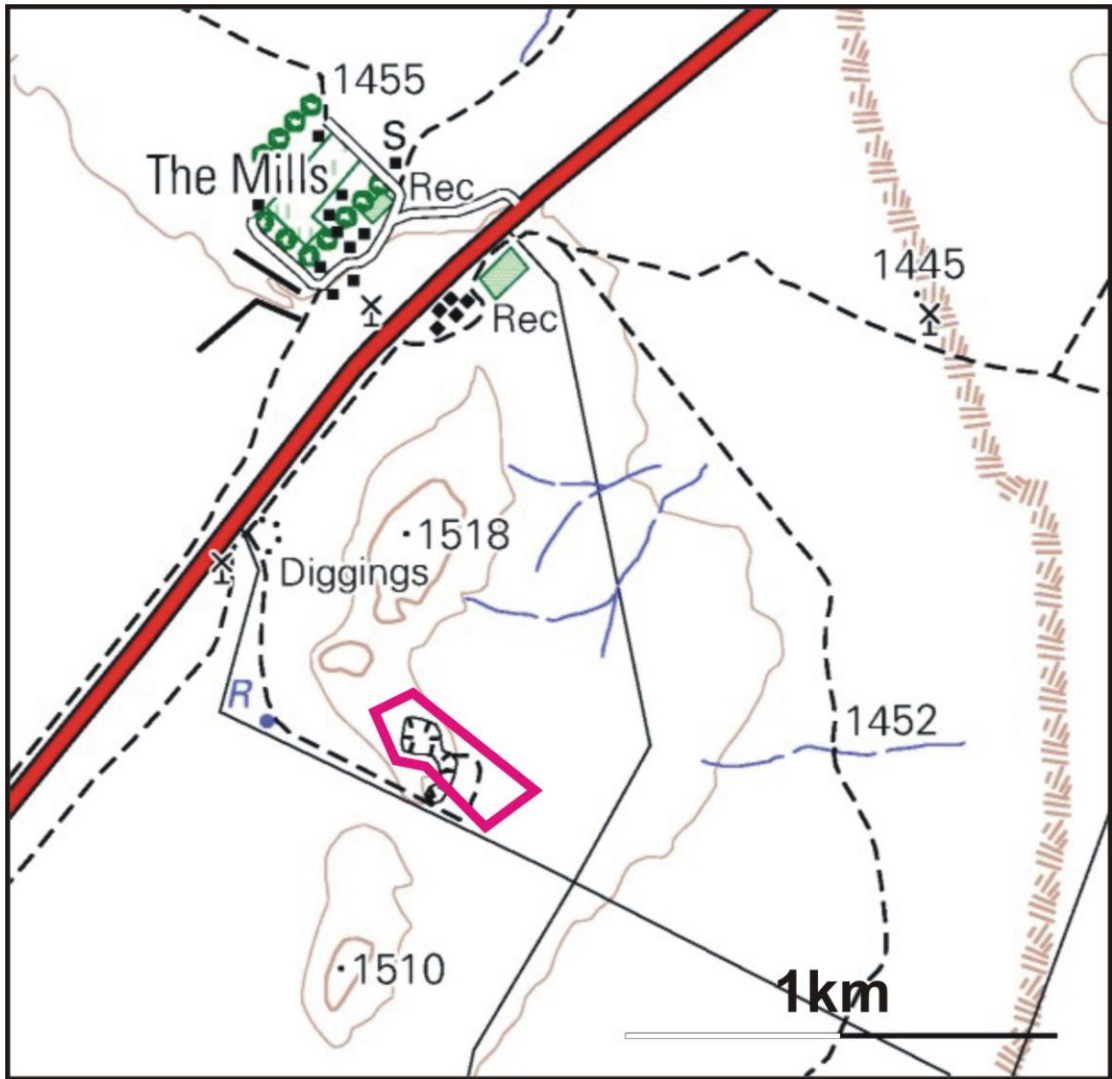


Figure 1. Location of affected area on farm Plooyfontein 93 (1:50 000 scale topographic map 3124 AB Hanover).



Figure 2. Aerial view of the locality in relation to Hanover.



Figure 3. Aerial view of the quarry.



Figure 4.). The affected area and existing quarry covers approximately 6ha and is situated on a large dolerite outcrop .

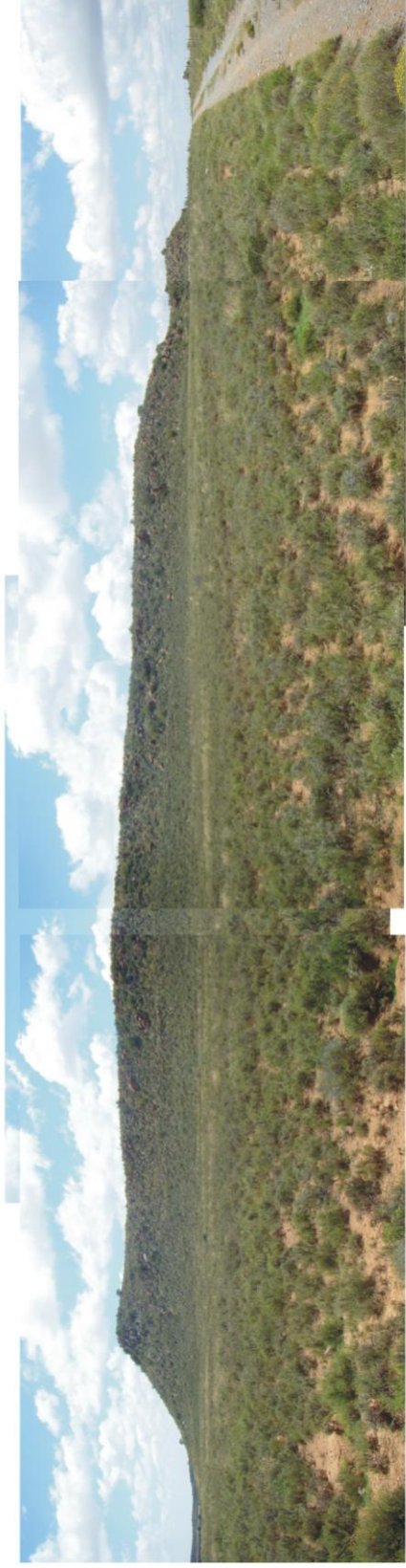


Figure 6. From the quarry, looking southwest towards the N1 (above) and from the N1, looking northeast towards the quarry (below).

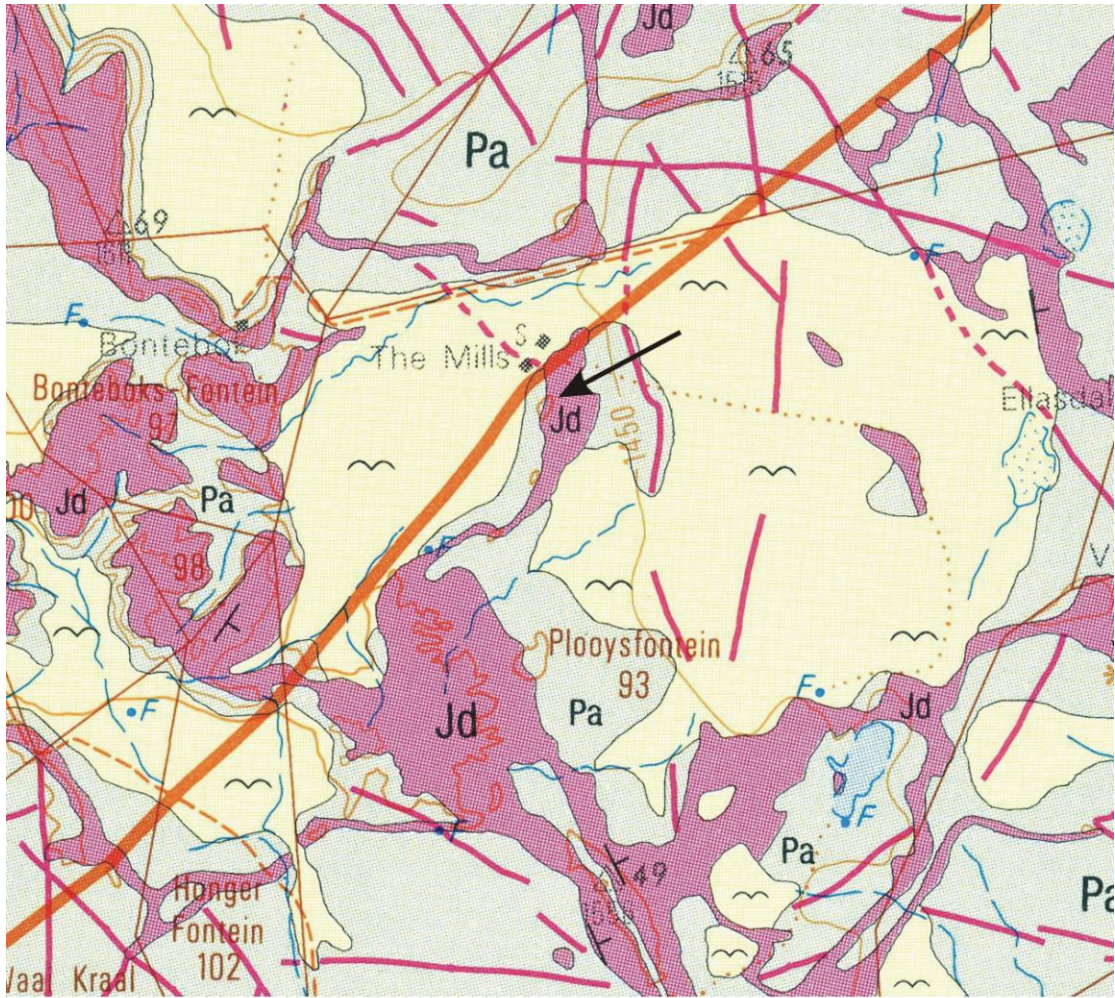


Figure 7. 1:250 000 geological map of the area (3124 Middelburg). The site is indicated by the arrow. From oldest to youngest, the geology in and around the affected area is made up of Permian sandstones and mudstone layers of the Adelaide Subgroup (*Pa*, Beaufort Group) Jurassic dolerite intrusions (*Jd*, Karoo Dolerite Suite) Quaternary alluvial sediments (flying bird symbol) and residual soil deposits.



Figure 8. The site is primarily underlain by dolerite bedrock.



Figure 9. *In situ* superficial sediments at the site are made up of geologically recent alluvium and residual soils.



Figure 11. Southwest corner of the site, looking east.

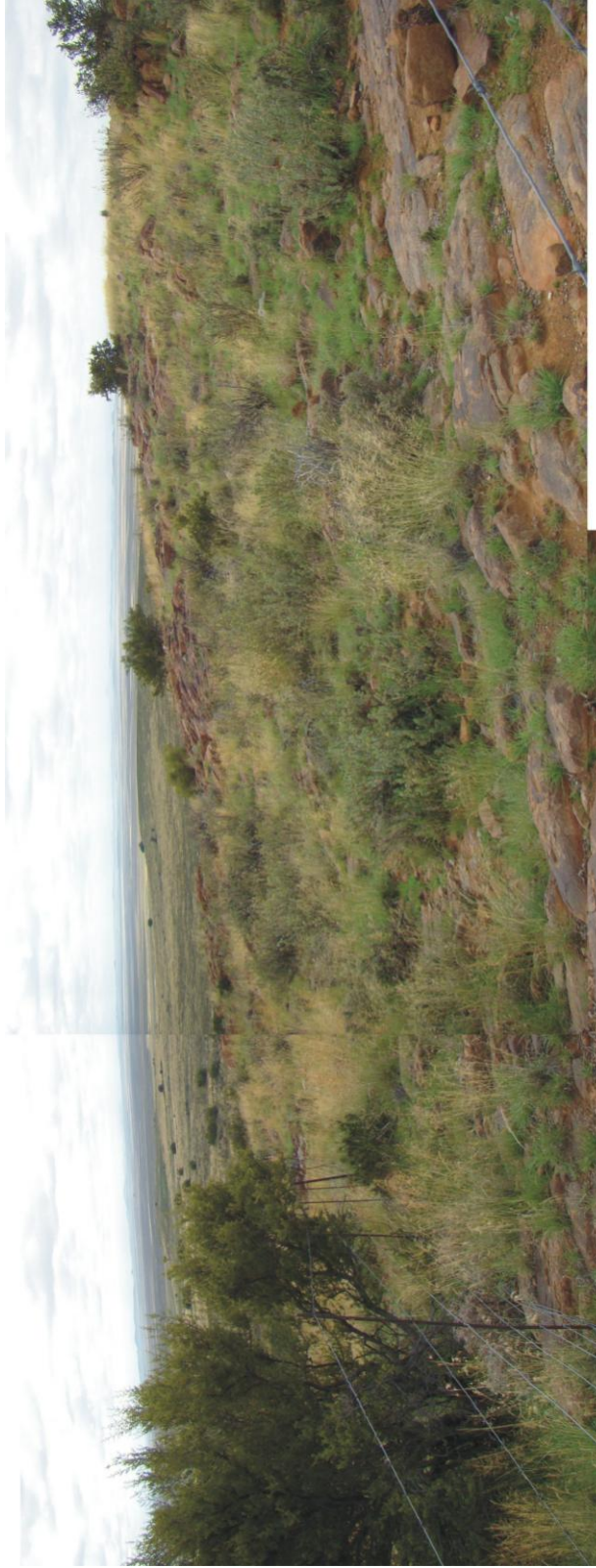


Figure 12 . Northwest corner of the site, looking east.



Figure 13. Northeast corner of the site, looking west with spoil heaps in foreground.



Figure 14. Southeast corner of the site, looking northwest.



Figure 15. Evidence of mining activities is evident over the whole terrain. Spoil heaps and dumps indicated by arrows.

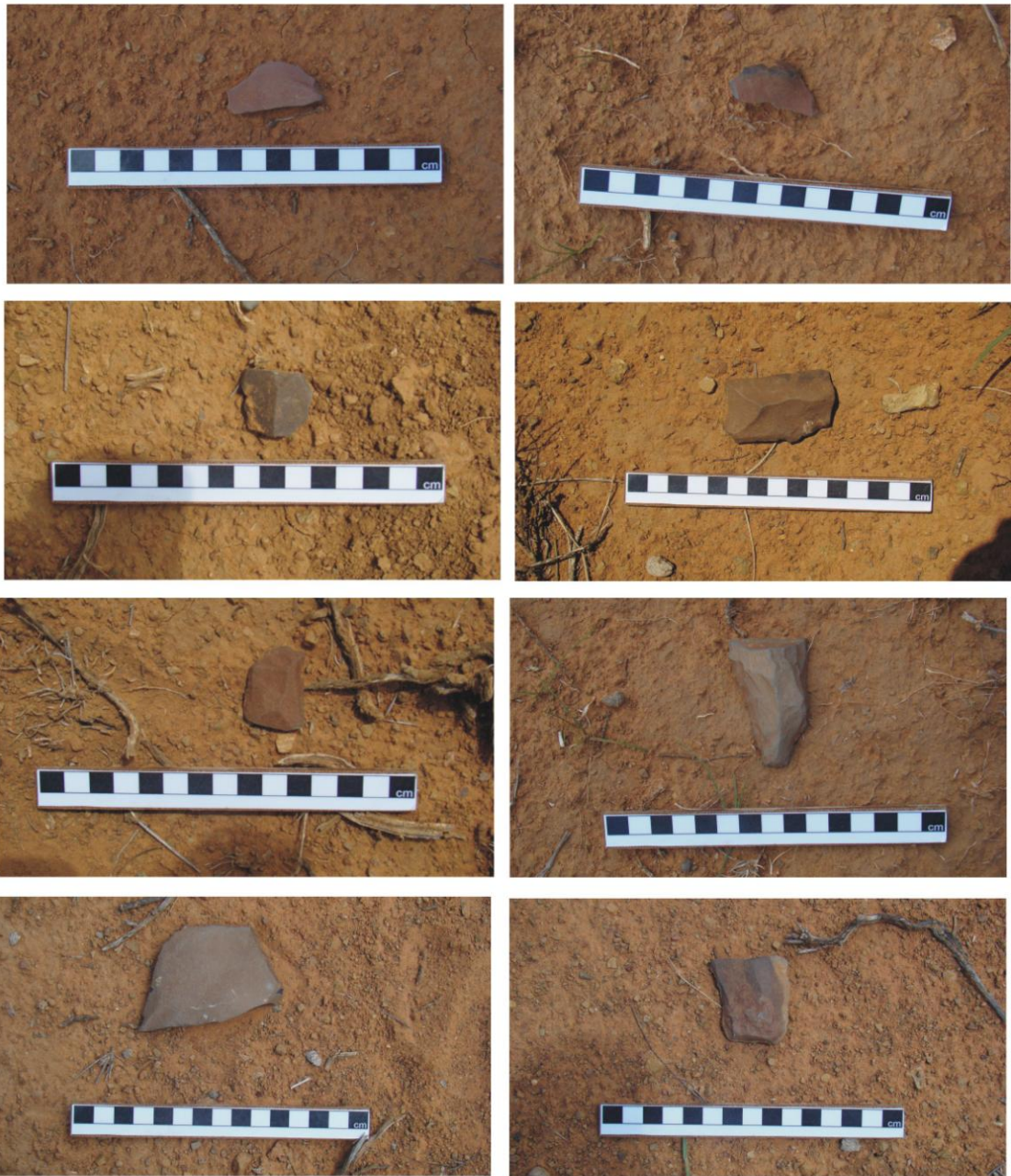


Figure 16. Individual stone tools recorded along the northeast and southwest boundaries of the study area. The material is largely represented by patinated and rolled flake blanks. No cores or formal tools were recorded.