

**Phase 1 Palaeontological Impact Assessment for a mining
right to mine 17.9 ha of Portion 18 (Portion 2) of the Farm
Louterbronnen 250, Theunissen, Free State Province.**

Palaeo Field Services
PO Box 38806
Langenhovenpark
Bloemfontein, 9330

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Summary

A Phase 1 Palaeontological Impact Assessment was carried out over a 17.9 ha area designated for dolerite mining on Portion 18 (Portion 2) of the farm Louterbronnen 250, Theunissen, Free State Province. The study area has been extensively degraded by previous mining activities while the footprint as a whole is located on a palaeontologically insignificant dolerite outcrop. The terrain is not considered palaeontologically vulnerable, and there are no major palaeontological grounds to suspend the proposed development, provided that all excavation activities are confined to within the confines of the development footprint and that future impact is restricted to dolerite outcrop only.

Introduction

A Phase 1 Palaeontological Impact Assessment was carried out over a 17.9 ha area designated for dolerite mining on Portion 18 (Portion 2) of the farm Louterbronnen 250, Theunissen, Free State Province (**Fig. 1**). The survey is required as a prerequisite for new development in terms of the National Heritage Resources Act 25 of 1999. In terms of Section 38 of the National Heritage Resources Act 25 of 1999, the survey is required as a prerequisite for any development that will change the character of a site exceeding 5 000 m² in extent. The task involved identification of possible 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 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 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.

Site Information

The affected area covers 17.9 ha, which also includes an existing quarry facility located about 2 km southwest of the R708 provincial road between Theunissen and Winburg.

1 to 50 000 topographical map: 2826BC Theunissen

1:250 000 scale geological map 2826 Winburg

Centroid site coordinates (Fig. 2): 28°24'54.27"S 26°43'40.05"E

Background

The Theunissen area is underlain by Karoo Supergroup rocks that have been intruded by dykes and sills of resistant Jurassic dolerites (*Jd*) which largely determine landscape topography as indicated by the distinctive koppies and flat-topped inselbergs in the region. (see 1: 250 000 geological map 2826 Winburg, Council for Geoscience, Pretoria,

Fig. 3) (Schutte 1994; Nolte 1995). These lava outcrops of the Karoo Igneous Province are erosional remnants made up of a network of dykes, sills and discordant sheets that are particularly well developed in the sedimentary sequences of the main and subsidiary Karoo basins (Duncan and Marsh 2006). The rocks form the base on which younger, superficial deposits of late Cenozoic age (*Qs*, *alluvium = flying bird symbol*) has been deposited. From oldest to youngest, the deposits of the Karoo Supergroup in the region are assigned Lower Beaufort Group rocks, represented by the Late Permian Adelaide Subgroup (*Pa*). The Adelaide Subgroup contains some of the richest Permo-Triassic tetrapod fauna from Pangaea/Gondwana and provides key evidence for evolution of mammalian characteristics among therapsids. The rocks in this outcrop area are assigned to one of eight different biostratigraphic units or assemblage zones (Rubidge 1995), namely the *Dicynodon* Assemblage Zone, recently revised (Kitching 1995; Van der Walt *et al.* 2010; Viglietti *et al.* 2016) (**Fig. 4**). The sediments assigned to this AZ are associated with stream deposits consisting of floodplain mudstones and subordinate, lenticular channel sandstones (McCarthy and Rubidge, 2005; Johnson *et al.*, 2006). The biozone is characterized by the presence of a distinctive and fairly common dicynodont genus (**Fig. 5 & 6**). Dicynodonts are well-known herbivorous therapsids from the Karoo Basin with at least 35 dicynodont genera recorded in the Beaufort Group. Therapsids from this biozone occur generally well-preserved in mudrock horizons and are usually found as dispersed and isolated specimens associated with an abundance of calcareous nodules. Other vertebrate fossils include fish, amphibians and amniotes. Molluscs, insects, plant (*Dadoxylon*, *Glossopteris*) and trace fossils (arthropod trails, worm burrows) also occur.

Field Assessment

The study area has been extensively degraded by previous mining activities while the footprint as a whole is located on a palaeontologically insignificant dolerite outcrop.

Impact Statement

The proposed development footprint is primarily underlain by intrusive igneous dolerites, which are considered to be of low paleontological significance. It is highly

unlikely that fossil remains will be encountered during excavation activities within the igneous bedrock.

Recommendations

The terrain is not considered palaeontologically vulnerable, and there are no major palaeontological grounds to suspend the proposed development, provided that all excavation activities are confined to within the confines of the development footprint and that future impact is restricted to dolerite outcrop only.

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. I have no interest in secondary or downstream developments as a result of the authorization of this project and have no conflicting interests in the undertaking of the activity.

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

14 / 02 / 2018

Tables and Figures

Table 1. Summary of impacts at the proposed footprint.

Geological Unit	Rock types and Age	Potential Palaeontological heritage	Impact by Development	Heritage potential at the site
Regolith	Alluvium, residual soils (Superficial deposits) Quaternary to Recent	Large vertebrate skeletal remains; freshwater molluscs, coprolites, microfossils	Low	Low
Karoo Dolerite (<i>Jd</i>)	Intrusive igneous bedrock. Jurassic	None	High	None
Adelaide Subgroup (<i>Pa</i>)	Fluvial and lacustrine mudstones and sandstones. Late Permian	<i>Dicynodon</i> Assemblage Zone Therapsids, amphibians, fish, amniotes, invertebrates, plant fossils, trace fossils.	None	None



Figure 1. Aerial view of the proposed development footprint (1:50 000 scale topographic 2826BC Theunissen).



Figure 2. General view of the study area.

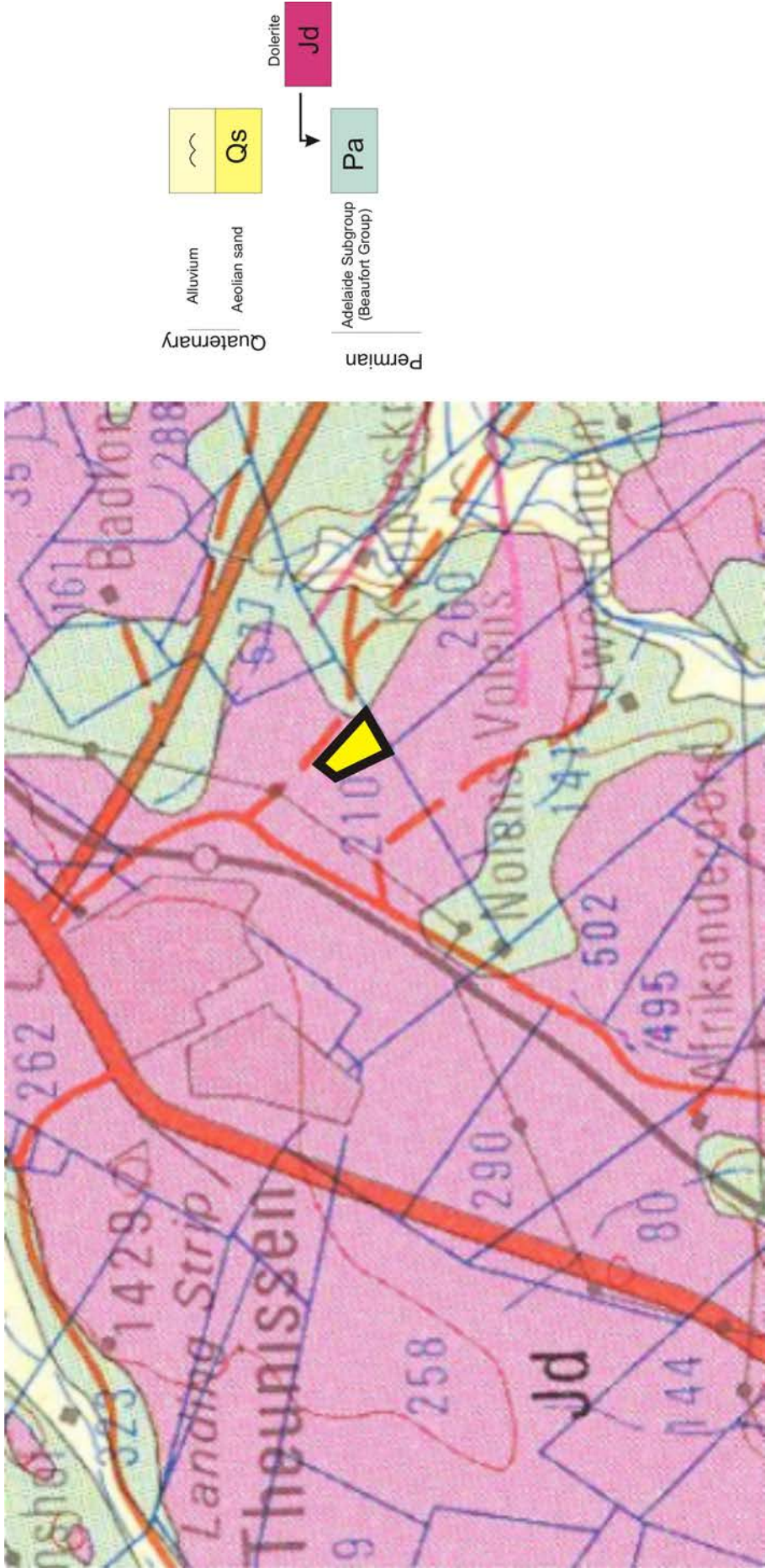


Figure 3. Portion of 1:250 000 scale geological map
2826 Winburg

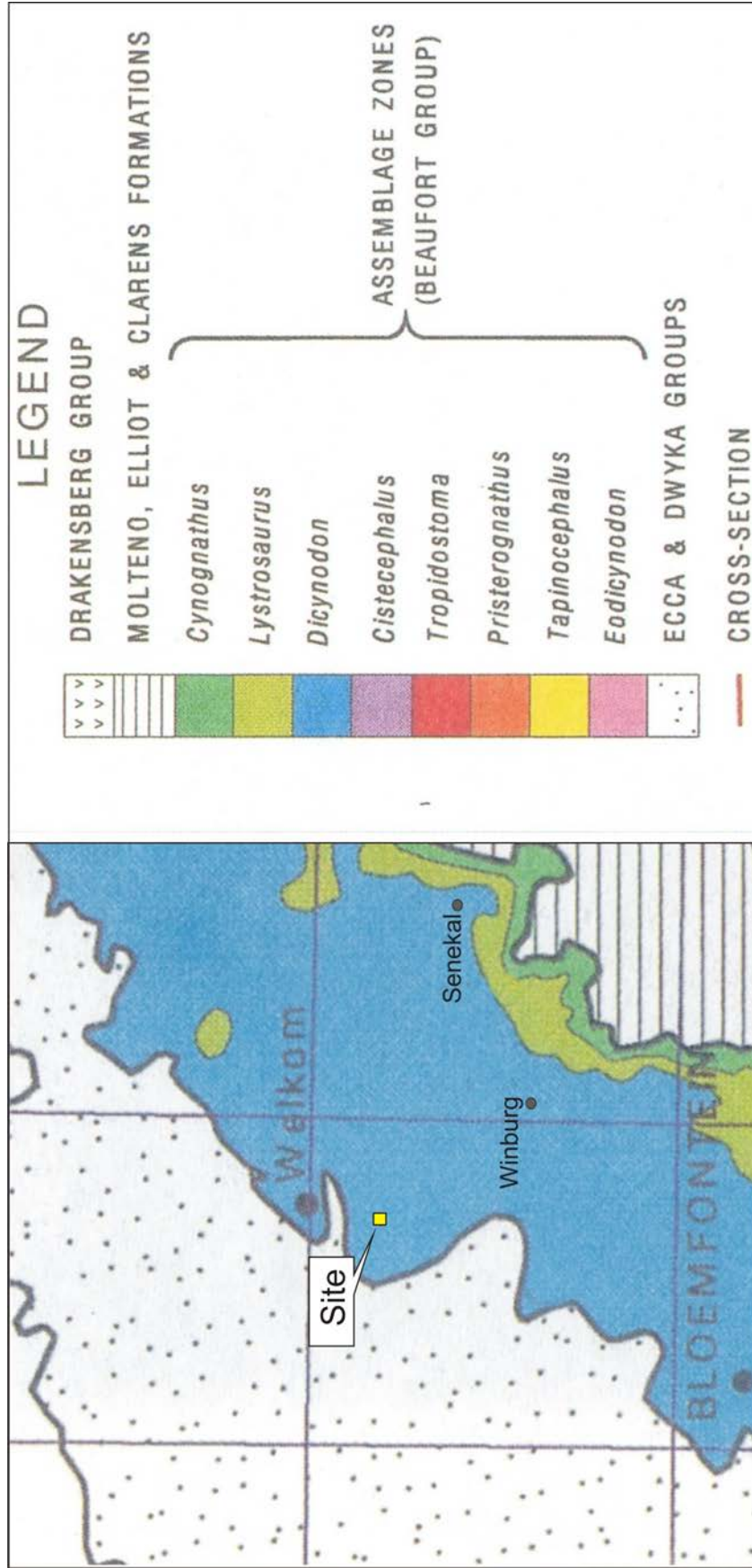


Figure 4. Geographic distribution of vertebrate biozones of the Beaufort Group (after Rubidge 1995).

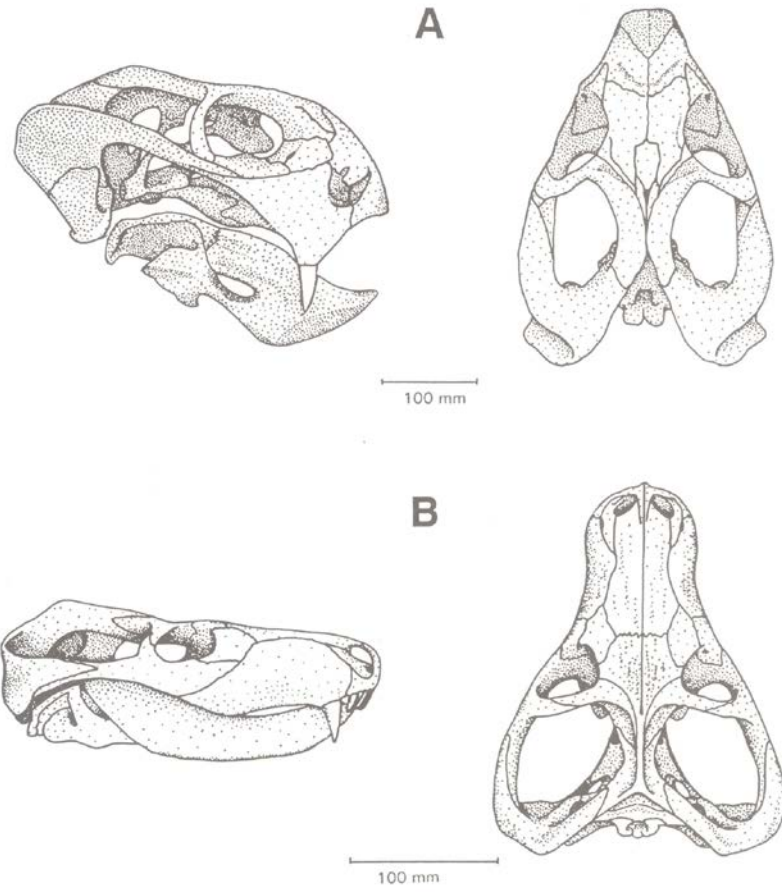


Figure 5. Lateral and dorsal views of biozone-defining fossils of the Dicynodon AZ.
(A) Dicynodon (B) Theriognathus

