

Palaeontological Heritage Assessment for provision of water, Middelberg

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Date: February 2011

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Geology

The study area is underlain by mudstones and sandstones of the Late Permian portion of the Balfour Formation of the Beaufort Group (Karoo Supergroup). This is intruded by dolerite (igneous) dykes and overlain, in places, by geologically recent alluvium and calcretised soils.

The strata of the Karoo Supergroup were deposited within the Karoo sedimentary Basin, which resulted from shortening and thickening of the southern margin of Africa, with coeval folding and uplift of the Cape Supergroup strata along its southern margin. The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this interval the basin evolved from an inland sea, to a giant lake fed by seasonal meandering (and at times braided) rivers. This lake steadily shrank as it filled with sediment and the basin's rate of subsidence stabilised. The land became increasingly arid and was covered with wind blown sand towards the end of its cycle. Finally the subcontinent was inundated with basaltic lava that issued from widespread linear cracks within the crust, to form the capping basalts of the Drakensberg Group.

The sediments of the mid Beaufort Group were deposited at a time when the Karoo Sea was largely silted up and rivers arising in the Cape Fold Belt Mountains, to the south, meandered across extensive flood planes into an inland lake. Sands were deposited along the river channels whereas periodic flooding deposited muds on the flood planes. These in time came to form the interbedded sandstones and mudstones of the Beaufort Group.

Sedimentary rocks to the north of Middleberg are associated with the *Dicynodon* (biostratigraphic) Assemblage Zone.

The area exhibits a number of dolerite dykes and sills intruded during formation of the Drakensberg Group.

Palaeontology

The flood planes of the Beaufort Group provide an internationally important record of life during the diversification of reptiles. This includes the evolution of the Therapsids, which would ultimately give rise to the mammals.

It is subdivided into a series of biostratigraphic units on the basis of its faunal content. The *Dicynodon* Assemblage Zone is represented in the study area. The *Dicynodon* Assemblage Zone is characterised by presence of the Dicynodont Therapsid, *Dicynodon* together with the Therocephalid Therapsid, *Theriognathus*.

Other Therapsids reported from the *Dicynodon* Assemblage Zone include a wide range of Dicynodontia, Biarmosuchia, Gorgonopsia, Therocephalia and Cynodontia. Fish, Amphibia and Reptilia of the Captorhinida and Eosuchia have also been described.

A single species of bivalve mollusc has been described. Diverse insects are known from this assemblage zone in Natal. Plants are represented by *Dadoxylon* (fossil wood), *Glossopteris* and *Schizoneura*. Trace Fossils include Arthropod trails and worm burrows.

Dolerite, being an intrusive igneous rock contains no fossils.

Site Visit

A site visit was carried out on the 29th and 30th of January to assess the sites of the boreholes, pipeline route and reservoir.

These were inspected on foot and, where the pipeline ran beside the road, partially by vehicle.

Both the northern and southern **borehole fields** are within dolerite intrusions.

Small outcrops to the north of **the pipeline linking these two fields** indicate that some Balfour Formation sandstones are situated between the dolerite intrusives. These sandstones have been somewhat altered due to proximity to the originally molten dolerite. No palaeontological material was observed. This section of pipeline route was explored on foot, revealing that the outcrop is entirely buried under soily alluvium. Deep aardvark burrows evidence a considerable depth of soil. Some calcrete is exposed approaching the dolerite of the northern borehole field. There was no indication of palaeontological material or worked stones in this calcrete.

Between the southern borehole field and the public road the pipeline route initially traverses dolerite, before crossing the broad, thickly silt covered flood plane of a small meandering river.

The pipeline route south alongside the public road is sited across thick soily alluvium with, in places, thin calcretised layers (revealed by sections in a series of small roadside borrow pits to the east of the road). Approaching town resistant dolerite approaches the surface before breaking it in a line of small hills. That to the east of the road contains a quarry from which the national roads agency have extracted dolerite aggregate. Thereafter the route again traverses thick alluvium until it reaches the outskirts of Middleberg adjacent to the N10.

Between the N10 and the Water Reservoir the route follows an existing waterline, excavation of which has revealed thick layers of soily alluvium with calcretised layers. No palaeontological material is apparent. The Water Reservoir is situated on a dolerite hill and the approach to it traverses dolerite. A small quarry to the north of the pipeline route (mid way between the correctional services facility and the reservoir) has been utilised for quarrying flagstones of Balfour Formation sandstone that has

been altered and hardened through proximity to the dolerite. No palaeontological material was observed in this quarry.

Conclusions and Recommendations

It is extremely unlikely that any significant palaeontological material will be impacted by this project and no areas of sensitivity were identified.

Should any suspected palaeontological material be unexpectedly disturbed the site officer should immediately notify a qualified palaeontologist to assess it.