

Palaeontological Heritage Assessment for Windfarm at Waainek, Grahamstown

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Background

Umlando cc was contracted by C.E.S. to undertake a heritage impact assessment of the proposed Waainek wind farm. The proposed area is located ~4km (south) west of Grahamstown (fig.1). Rob Gess Consulting was subcontracted to undertake a Palaeontological Impact Assessment.

The proposed development consists of twelve wind turbines that will be located on the top of three quartzite topped hills.

The activities in the affected area will be:

- Wind turbine base, and depth
- Access roads
- Underground cables

Geology

The stratigraphy of the area comprises the upper portion of the Cape Supergroup. The Cape Supergroup is comprised of sediments deposited along the northern edge of the semi-enclosed Agulhas Sea, which opened in response to early rifting between South America, Africa and Antarctica.

It is subdivided, from bottom to top, into the Table Mountain Group, the Bokkeveld Group and the Witteberg Group. Of these only the Witteberg Group outcrops in the study area

The Witteberg Group is divided into the (lower) Weltevrede Subgroup and the (upper) Lake Menz Subgroup. Weltevrede Subgroup strata are exposed below the development area alongside the N2 and in the bottom of valleys dividing the ridges.

The Lake Menz Subgroup consists of four subunits (the Witpoort, Kweekvlei, Floriskraal and Waaipoot formations. The ridge tops within the study area represent, by and large, the more resilient quartzitic strata of the Witpoort Formation. These strata are deeply folded in the area, and quartzitic layers of the overlying Floriskraal Formation may also be represented.

Witpoort Formation quartzites are characteristically a clean whitish colour and are latest Devonian, Famennian (approximately 360 million years old). They represent mature shoreline sands.

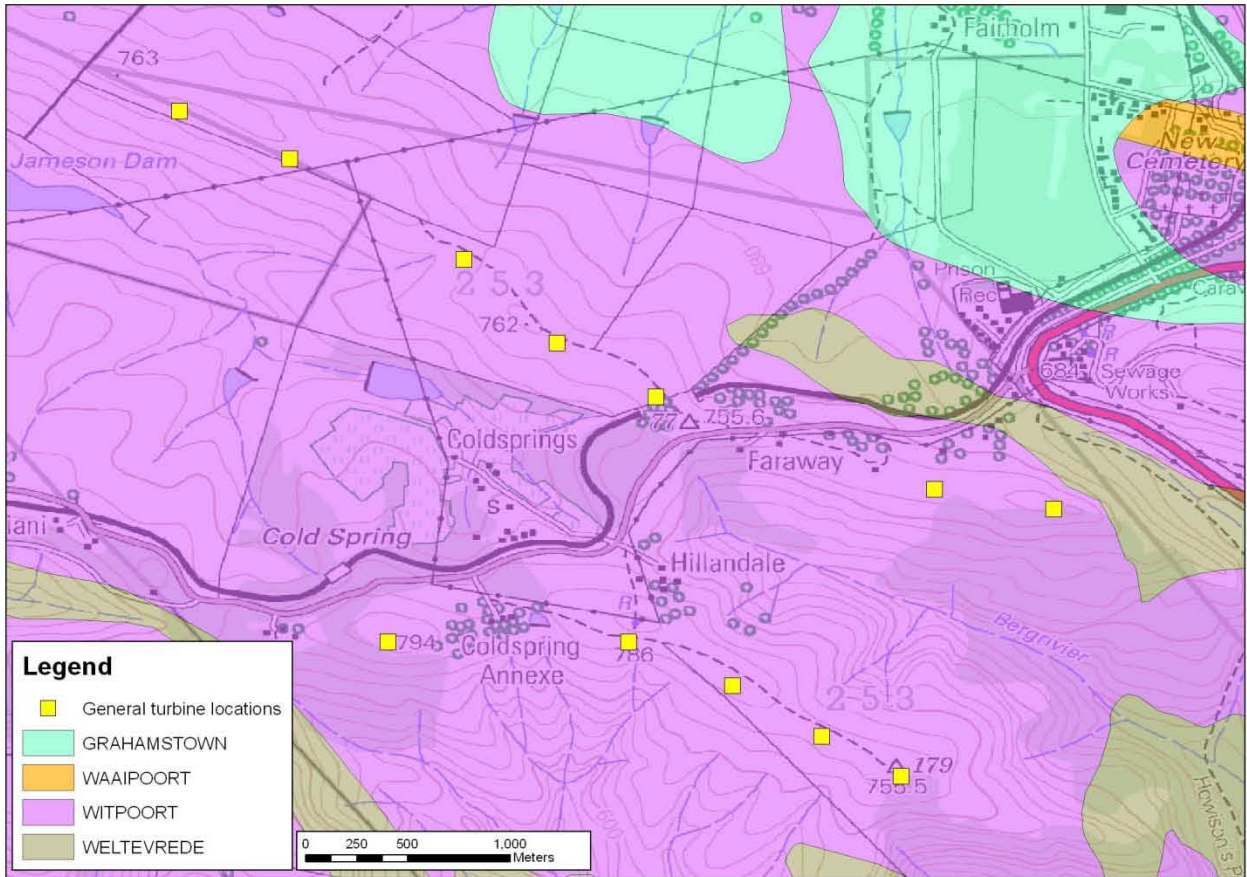


Fig. 1: Geological map of Waainek illustrating the position of the proposed wind turbines

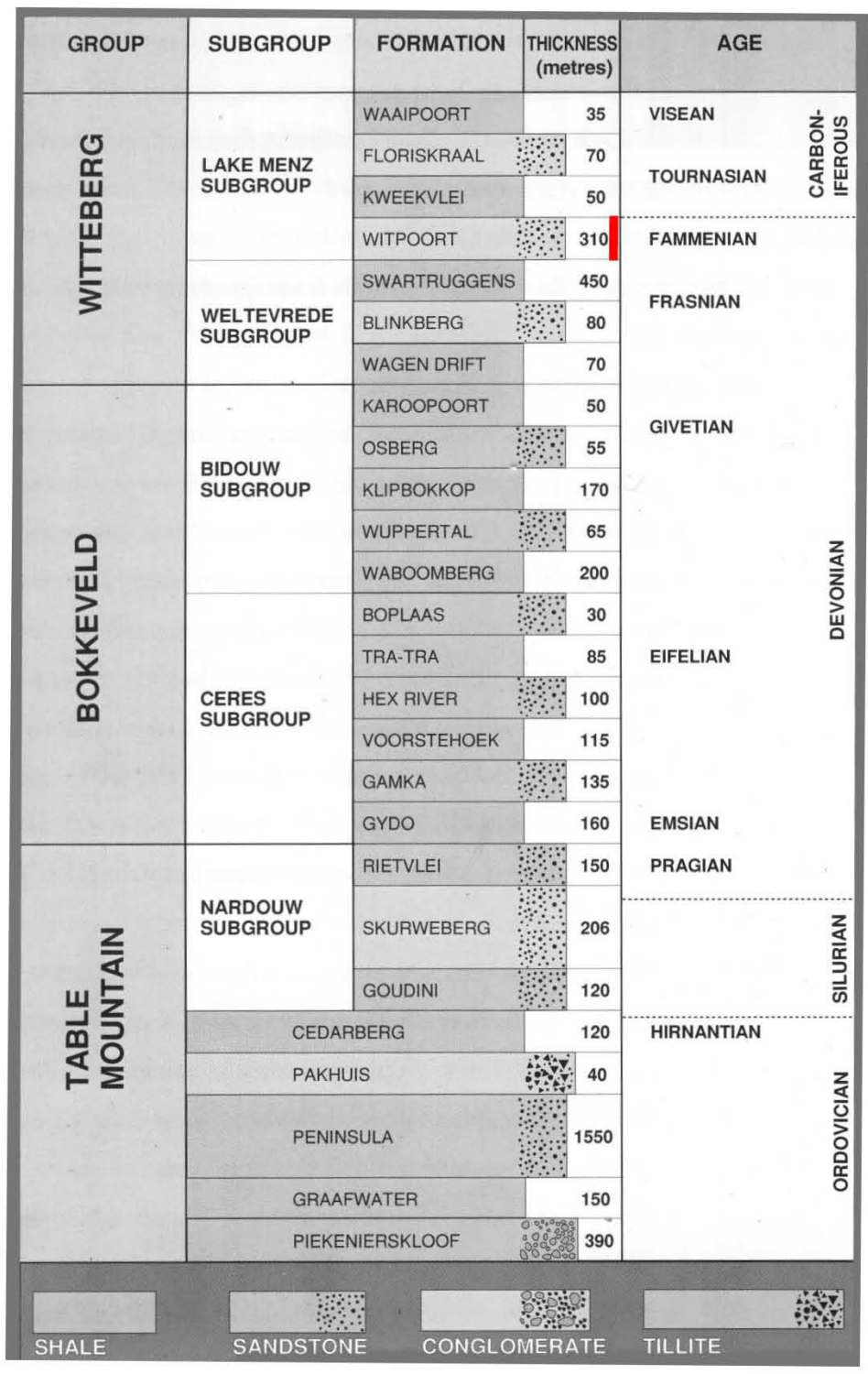


Fig. 2: Stratigraphic column of the Cape Supergroup with the Witpoort Formation highlighted in red.

Palaeontology

Plant fossils in blackish shales within the Witteberg were first noted by Bain in 1857. Although these were predominantly within the Weltevrede Formation they included material from a black shale outcropping within the lowermost Witpoort Formation at Howisopns Poort.

The Howison's Poort locality may still be located. It is sited about fifteen metres above the bottom of the Witpoort Formation sequence and consists of a black shale less than a metre thick within a cliff of quartz rich sandstones. Various researchers have subsequently recovered plant fragments from pieces of shale that can, with difficulty, be winkled out of the cliff. A number of taxa have been described. Until the 1980s this remained essentially the only known fossil locality within the Witpoort Formation. Impressions of plant stems have been recovered from adjacent quartzites.

Interception of a relatively thick black shale near the top of the Witpoort Formation during roadworks at Waterloo Farm near Grahamstown in 1985, engendered the discovery of sub-saharan Africa's most important Late Devonian fossil site. This site is of particular international interest, not just due to its comprehensive preservation of a fauna and flora, but also because it belongs to the latest Famennian age, immediately preceding the world-changing second great extinction event. This was an important time period when enormous environmental upheavals were triggered by the emergence of the first forests, whole groups of organisms went entirely extinct and the earliest tetrapods emerged from the water to exploit the first widespread terrestrial environments.

Research on the Waterloo Farm fossils is ongoing, however, a fauna of about 20 species of fossil fish has been isolated, of which about a third have thus far been taxonomically defined. Some of these, such as the world's oldest fossil lamprey, *Priscomyzon riniensis*, have caused an international stir. *Priscomyzon* provides an example of the unusual type of preservation at Waterloo Farm, where impressions of soft tissues, rather than just bones, are recorded. The fauna also contains a range of armour plated (placoderm) fish, spine finned (acanthodian) fish, ancient sharks, early ray-finned fish, and lobe-finned fish including coelacanths. These are accompanied by arthropods such as scorpions and giant euryperids ('water-scorpions'), in addition to one of the world's most significant records of algae and plants from the latest Devonian.

Significant trace fossils including *Cruziana* and *Rusophycos* have been recovered from adjacent quartzites, as have plant fossil impressions. These include the only recorded examples of *Leptophloen australe* in which the root bases are preserved.

Site Visit

A three hour site visit was conducted on the 11th of February. Due to time constraints only the tops of the ridges, where the turbines will be situated, were explored on foot. Outcrops were examined for palaeontological material.

Although a large amount of outcropping quartzite was examined within the area, no palaeontological material was identified.

Conclusions and Recommendations

1. It is unlikely that any palaeontological material will be disturbed during the execution of this project.
2. Should any material of a palaeontological nature be disturbed during execution of this project this will be significant to current studies of the Witpoort Formation. Any material discovered during the construction phase and thought to represent fossils or trace fossils should therefore be immediately reported to a qualified palaeontologist.



Fig. 3: Typical outcrop of Witpoort Formation quartzite on the ridge behind the monastery.