

RECOMMENDED EXEMPTION FROM FURTHER PALAEOLOGICAL STUDIES:

PROPOSED CONSTRUCTION OF POSTMASBURG SOLAR PV ENERGY FACILITY 2 ON THE REMAINDER OF THE FARM KAPSTEWEL 436 NEAR POSTMASBURG, ZF MCGAWU DISTRICT, TSANTSABANE LOCAL MUNICIPALITY, NORTHERN CAPE

John E. Almond PhD (Cantab.)
Natura Viva cc,
PO Box 12410 Mill Street,
Cape Town 8010, RSA
naturaviva@universe.co.za

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1. OUTLINE OF THE PROPOSED DEVELOPMENTS

It is proposed to develop Postmasburg Solar PV Energy Facility 2, consisting of 75 MW generation capacity on the Remainder of the farm Kapstewel 436, situated c. 23 km north of Postmasburg on the eastern side of the R385 between Postmasburg and Sishen, Hay District, Northern Cape (Fig. 2).

The total footprint of the facility will not exceed 240 ha and will include a 2-5 ha laydown area. Access roads are expected to vary between 6 m – 8 m in width. The length of the roads depends on the various layouts to be assessed. The facility will connect directly to the existing Manganore Substation *via* a 132 kV transmission line. The Manganore Substation will need to be upgraded. Various grid connections are under consideration but, given the proximity of the substation (see Fig. 2), all options will be short. The transmission line poles will be steel monopole structures and the servitude width is expected to be 32 m. The lifetime of the facility is 2-25 years and the site will be rehabilitated at the end of the project.

Environmental Impact Assessments for the solar energy projects are being conducted by Cape Environmental Assessment Practitioners (Pty) Ltd, George for Postmasburg Solar PV Energy Facility 2 (Contact details: First Floor, Eagles View Building, 5 Progress Street, George. PO Box 2070, George, 6530. Telephone: (044) 874 0365 Facsimile: (044) 874 0432. Web: www.cape-eaprac.co.za).

The present combined palaeontological heritage comment for the two adjacent solar facility developments has been commissioned by Mr Stefan de Kock of PERCEPTION Planning, George (Contact details: PO Box 9995, George 6530, Western Cape, South Africa. Fax: +27(0)86 510 8357. Mobile: +27(0)82 568 4719) on behalf of Postmasburg Solar PV Energy Facility 2 (Pty) Ltd.

2. GEOLOGICAL BACKGROUND

The proposed solar energy facilities will be established on flat terrain between 1420 and 1470 m amsl on the Farm Kapstewel 436, between the R325 tar road and a low range of hills to the east, the Klipfonteinheuwels (Fig. 2). According to the relevant 1: 250 000 geology map sheet 2822 Postmasburg (Fig. 1) the area is almost entirely underlain by Precambrian marine carbonate sediments of the **Campbell Rand Subgroup** (Ghaap Group, Transvaal Supergroup) that here build a broad, N-S trending anticline known as the Maremane Dome. Locally the Precambrian bedrocks are overlain by Quaternary aeolian sands of the **Gordonia Formation** (Kalahari Group), calcretes and downwasted surface gravels (*e.g.* chert breccias). Economically important Precambrian sediments of the **Manganore Iron Formation** (*cf* Cairncross & Beukes 2013) that unconformably overlie the carbonate bedrocks in the hills along the crest of the Maremane Dome will not be directly impacted by the proposed solar energy facility developments and are not of palaeontological heritage significance.

3. PALAEOLOGICAL HERITAGE

The 2.6 to 2.5 billion-year-old shallow shelf and intertidal carbonate sediments within the lower part of the **Ghaap Group** (*i.e.* **Schmidtsdrif** and **Campbell Rand Subgroups**) are well known for their rich fossil biota of *stromatolites* or microbially-generated, finely-laminated sheets, mounds and branching structures. Some stromatolite occurrences on the Ghaap Plateau of the Northern Cape are spectacularly well-preserved (*e.g.* Boetsap locality northeast of Daniëlskuil figured by McCarthy & Rubidge 2005, Eriksson *et al.* 2006). Some of the oldest known (2.6 Ga) fossil microbial assemblages with filaments and coccoids have been recorded from stromatolitic cherty limestones of the Lime Acres Member, Kogelbeen Formation at Lime Acres.

The fossil record of the **Kalahari Group** is generally sparse and low in diversity. The **Gordonia Formation** dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation. However, mummification of soft tissues may play a role here and migrating lime-rich groundwaters derived from the underlying bedrocks (including, for example, dolerite) may lead to the rapid calcretisation of organic structures such as burrows and root casts. Occasional terrestrial fossil remains that might be expected within this unit include calcretized rhizoliths (root casts) and termitaria (*e.g.* *Hodotermes*, the harvester termite), ostrich egg shells (*Struthio*) and shells of land snails (*e.g.* *Trigonephrus*) (Almond 2008, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g.* *Corbula*, *Unio*) and snails, ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands. These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the Gordonia Formation is therefore considered to be low. Underlying calcretes of the **Mokolanen Formation** might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings such as pans) may be expected occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient, Plio-Pleistocene alluvial gravels

4. CONCLUSIONS & RECOMMENDATIONS

The Precambrian marine limestones of the Campbell Rand Subgroup that underlie the study area at depth may contain well-preserved stromatolites (fossil microbial domes). However, these readily-weathered bedrocks are poorly exposed in the flat-lying study area, where they are extensively mantled by fossil-poor Late Caenozoic deposits such as Kalahari sands, calcretes and surface gravels. It is concluded that the proposed Postmasburg Solar PV Energy Facility 2, including the short associated transmission lines to Manganore Substation, are unlikely to have significant impacts on local palaeontological heritage resources.

It is therefore recommended that, pending the discovery of significant new fossils remains before or during construction, exemption from further specialist palaeontological studies and mitigation be granted for the proposed Postmasburg Solar PV Energy Facility 2 on Farm Kapstwel 436 near Postmasburg.

Should any substantial fossil remains (*e.g.* well-preserved stromatolites, mammalian bones and teeth) be encountered during excavation, however, these should be safeguarded, preferably *in situ*, and reported by the ECO to SAHRA, *i.e.* The South African Heritage Resources Authority, as soon as possible (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

5. KEY REFERENCES

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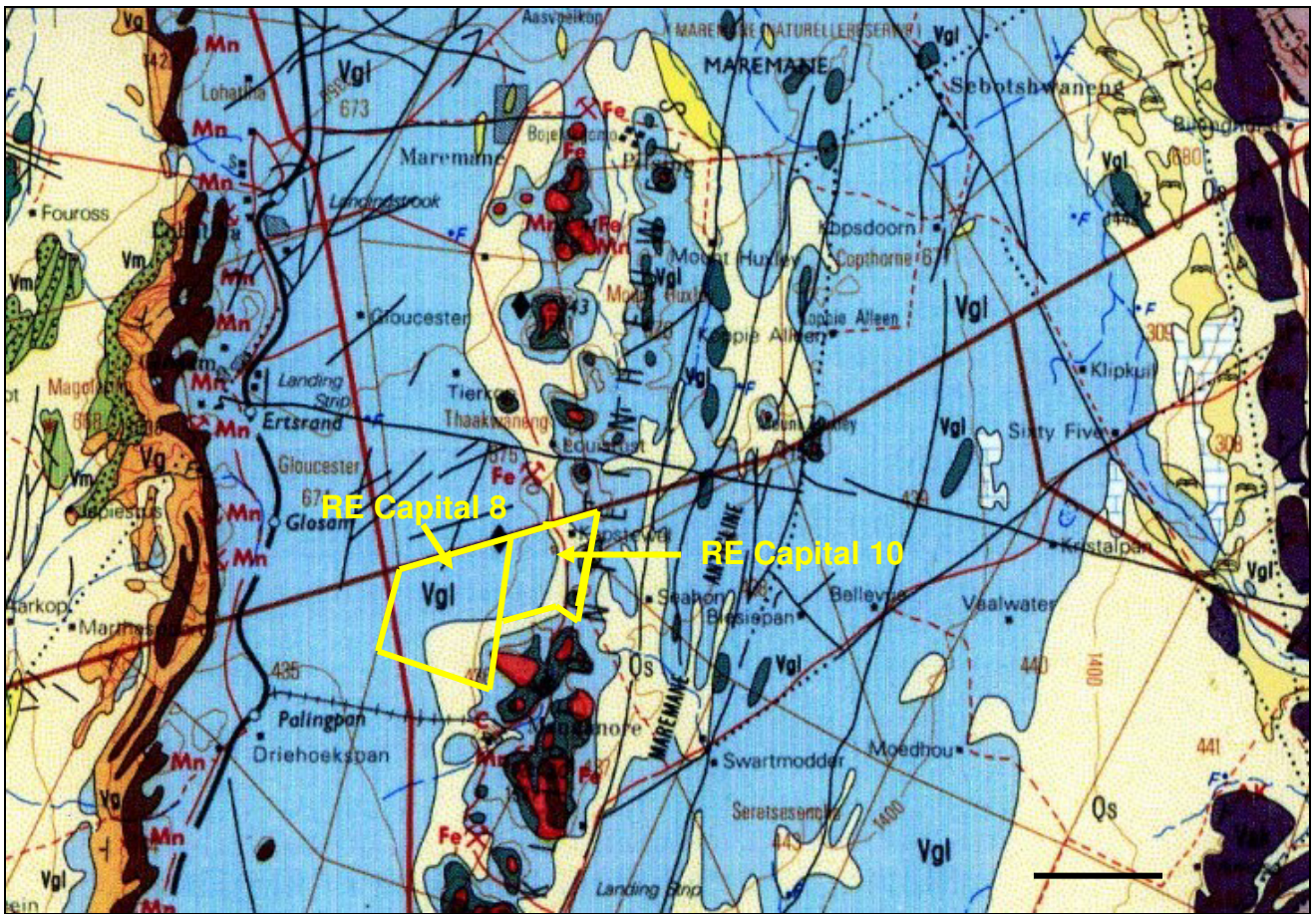


Figure 1: Extract from 1: 250 000 geology map 2822 Postmasburg (Council for Geoscience, Pretoria) showing the location of the study areas on Farm Kapstewel 436 c. 23 km north of Postmasburg (yellow polygons). The scale bar = c. 2 km. North is towards the top of the map. The study area is underlain by Precambrian carbonate sediments of the Campbell Rand Subgroup (Vgl, pale blue) that are locally mantled by aeolian sands of the Gordonia Formation (Kalahari Group) (Qs, pale yellow) and other unmapped superficial deposits.



Figure 2: Google earth© satellite image showing the location of the study areas for the RE Capital 8 (yellow polygon) and RE Capital 10 (orange polygon) PV solar facilities on Portion 4 of Farm Kapstewel 436, situated on the western side of the Klipfonteinheuwels and c. 23 km north of Postmasburg, Northern Cape. The Manganore mine is seen towards the southern edge of the image and the existing Manganore Substation is indicated by the red arrow.

6. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the aegis of his Cape Town-based company *Natura Viva cc*. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



Dr John E. Almond
Palaeontologist
Natura Viva cc