# RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES:

# Proposed Tikwana Solar Park near Hoopstad, Lejweleputswa District Municipality, Free State

**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 DEVELOPMENT

Firefly Investments 227 (Pty) Ltd is proposing to develop a solar photovoltaic solar facility on a part of erf 835 (*preferred site*) or on erven 807, 808, 809, 810, 811, 812, 822, 823, 824, 827, 828, 829, 830, 832, 833 and a portion of the street between these listed erven (*alternative site*) in Hoopstad Extension 14, adjacent to Tikwana township near Hoopstad, Lejweleputswa District Municipality, Free State. The site is located on the southern side of the Hoopstad – Wesselsbron tar road and approximately 4 km east-southeast of the town of Hoopstad. The study area is approximately 47 hectares in area. Two alternative sites have been identified (See Fig. 1). The proposed Tikwana Solar Park will have a total generating capacity of 9 MW. In addition to the photovoltaic panels, associated infrastructure includes a connection to the adjacent Eskom Hoopstad substation on the eastern side of the proposed development, service roads, as well as water and sewerage lines for administrative and accommodation areas.

The present palaeontological heritage comment has been commissioned by Africa Geo-environmental Services (AGES), Polokwane, as part of a Heritage Impact Assessment of the proposed development (See also Hutten 2011).

## 2. GEOLOGICAL BACKGROUND

The geology of the study area is shown on 1: 250 000 sheet 2724 Christiana (Council for Geoscience, Pretoria) (Schutte 1994) (Fig. 2). The entire study area is underlain by **Quaternary calcretes (Qc)** that overlie Mid to Late Permian basinal mudrocks of the **Volksrust Formation** (Ecca Group, Karoo Supergroup) at depth. According to Schutte (1994) the Volksrust beds here comprise blue-grey micaceous siltstones and shales, but are only very rarely exposed in the Christiana 1: 250 000 sheet area. The generally held view is that the Ecca Sea was a largely land-locked, non-marine depository (*e.g.* McLachlan & Anderson 1973) but the presence of the mineral glauconite in the Vryheid Formation as well as the recent report of a marine megadesmid bivalve from the upper Volksrust Formation in KZN suggests that a degree of marine influence persisted into Late Permian times in this portion of the Main Karoo Basin at least (Cairncross *et al.* 2005).

Field photographs and satellite images in the Heritage Impact Assessment report by Hutten (2011) show that the study area is very flat with little or no bedrock exposure.

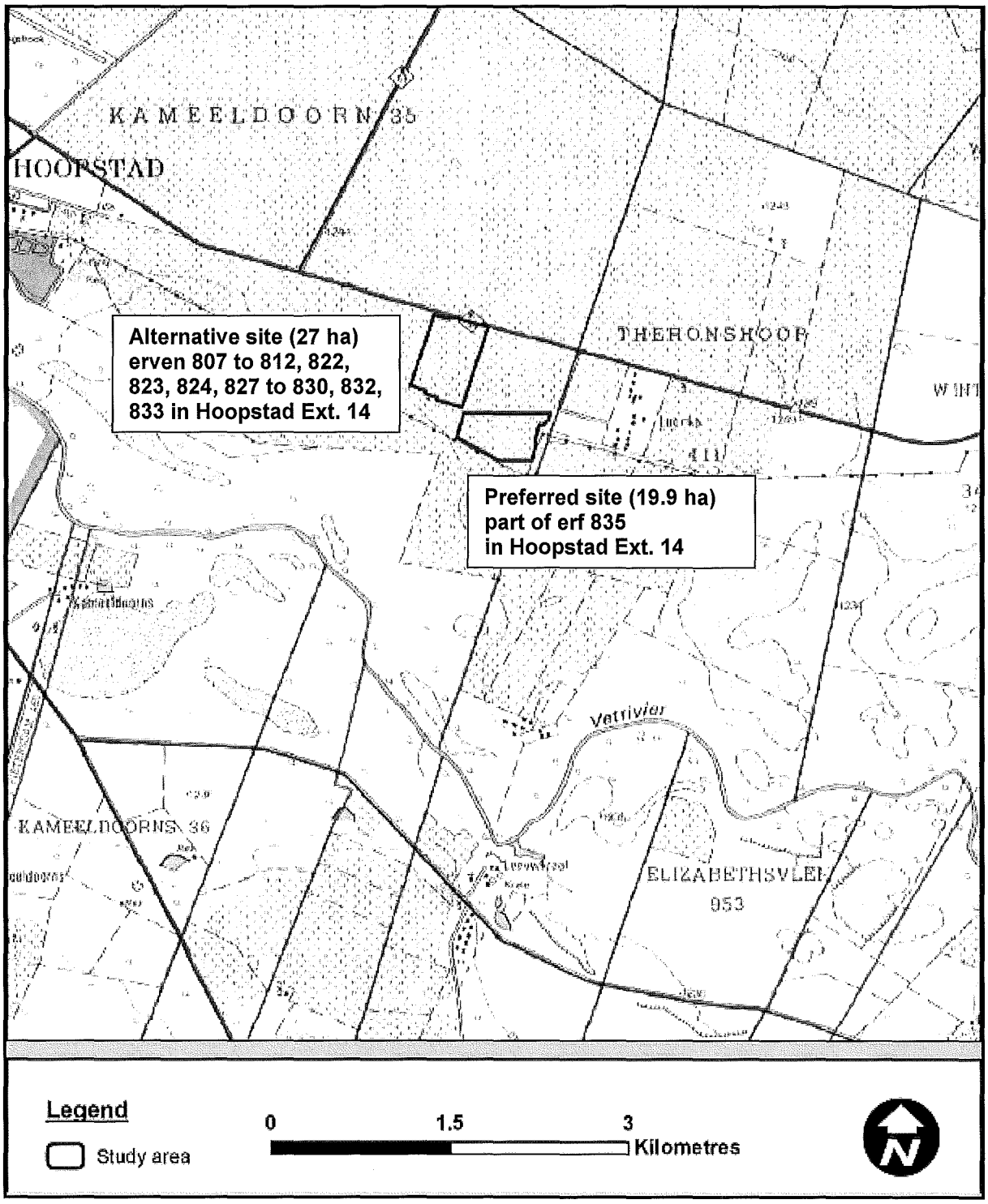


**Fig. 1. Map showing location of the Tikwana Solar Park study area (red polygons) some 4 km ESE of Hoopstad, Free State (abstracted from HIA report by Hutten, 2011).**

## 3. PALAEONTOLOGICAL HERITAGE

Superficial sediments (*e.g.* colluvium, alluvium, soils, pedocretes) mantling the Karoo Supergroup bedrocks are generally only very sparsely fossiliferous. Calcrete hardpans may contain low diversity assemblages of trace fossils (*e.g.* calcretised termitaria, plant root systems), while bones and teeth of terrestrial vertebrates and molluscs may accumulate in solution hollows of hyaena dens (best known from coastal areas). No fossil remains are reported from the calcretes in the

Christiana sheet area by Schutte (1994), although Stone Age artefacts – probably Pleistocene in age - embedded within these rocks are indeed mentioned.

The Mid to Late Permian fossil heritage of the basinal, mudrock-dominated **Ecca Group** succession in Free State area is also very sparse and poorly-known. This is partially, but not entirely, attributable to poor levels of bedrock exposure and extensive surface weathering in the region as a whole. The following fossil groups might occur within fresh (*i.e.* unweathered) Ecca Group rocks in the study area (*e.g.* Taverner Smith *et al.* 1988, Bamford 2004, Cairncross *et al.* 2005):

- acritarchs (organic-walled microfossils)
- megadesmid bivalves
- rare temnospondyl amphibian remains
- vertebrate microfossils (*e.g.* fish teeth, spines, scales) within diagenetic nodules
- wind-blown insect remains
- petrified driftwoods ("*Dadoxylon*")
- low-diversity trace fossils assemblages of the *Cruziana, Scoyenia* and – especially - *Mermia* ichnofacies

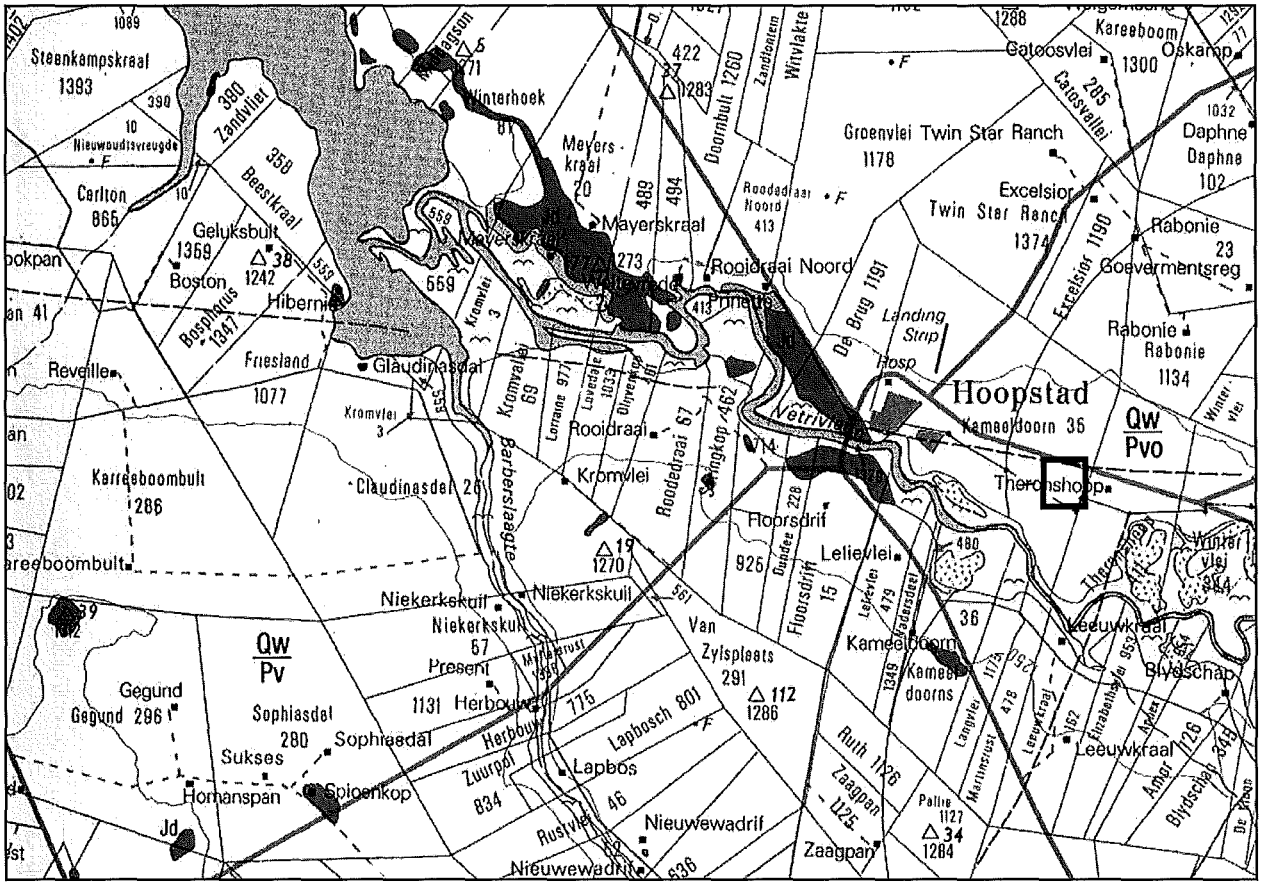


**Fig. 2. Extract from 1: 250 000 geological map 2724 Christiana (Council for Geoscience, Pretoria) showing approximate location (black rectangle) of the study area *c.* 4 km ESE of Hoopstad, Free State. Geological units represented in this area are Quaternary calcretes (Qc, pale yellow) that here overlie basinal mudrocks of the Volksrust Formation (Ecca Group; Pvo). Early Jurassic dolerite intrusions crop out to the west of Hoopstad, while various alluvial deposits are associated with the Vetrivier to the south (mid yellow with flying bird symbol).**

## 4. CONCLUSIONS & RECOMMENDATIONS

The proposed Tikwana solar park development near Hoopstad is of LOW significance in terms of local palaeontological heritage because:

- The potentially-fossiliferous Ecca Group bedrocks here are entirely mantled in superficial sediments of low palaeontological sensitivity. These mainly comprise Quaternary calcretes that mantle both the preferred and the alternative development sites;
- Extensive, deep bedrock excavations are not envisaged for this sort of solar park development.

**It is therefore recommended that exemption from further specialist palaeontological studies and mitigation be granted for this solar park development.**

Should any substantial fossil remains (*e.g.* vertebrate bones and teeth) be encountered during excavation, however, these should be reported to SAHRA for possible mitigation by a professional palaeontologist.

## 5. REFERENCES


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## 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 as well as Limpopo, Free State and Gauteng 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 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.

John E. Almond

**Dr John E. Almond**
**Palaeontologist**
***Natura Viva* cc**