

**PALAEONTOLOGICAL HERITAGE SCREENING INPUT:****PROPOSED KHAUTA SOLAR PV CLUSTER NEAR WELKOM, FREE STATE PROVINCE**

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**EXECUTIVE SUMMARY**

- Based on geological mapping and satellite imagery, the great majority of the large and small solar facility project areas as well the grid connection corridors are of Low to Medium Palaeosensitivity.
- No palaeontological red flags or no-go areas have been identified here.
- Small outcrop areas of Adelaide Subgroup continental sediments traversed by the 132 kV corridor option to Everest Substation as well as both 44 kV corridor options (see blue-grey areas in Figure 1) are *potentially* of High Palaeosensitivity but this can only be verified through a palaeontological site visit.
- There is no preference for either one or other of the two 132 kV and two 44 kV route options on palaeontological heritage grounds.

**1. Project outline**

WKN Windcurrent SA (Pty) Ltd is proposing to develop three 100MW Solar PV Energy Facilities near Welkom in the Free State Province. Each facility will be a separate application and will thus have separate associated reports. Since there are no Eskom grid lines with available capacity crossing the sites, a separate application for a 132 kV overhead power-line grid connection of approximately 12km length will be required. Two route options for the 132kV line are under consideration, connecting respectively to the Leander or Everest Substations (orange lines in Fig. 1).

Two smaller (19.9 MW) additional facilities, situated just to the south of the 3 x 100 MW facilities, may also be developed, depending on the available suitable space. These smaller facilities will also be connected to a new separate Eskom 44 kV power line for which two route options to the Riebeckstad Substation are under consideration (blue lines in Fig. 1).

**2. Geological & palaeontological context**

Based on the published 1: 250 000 geological map 2726 Kroonstad (Schutter 1993) (Figure 1), the combined project areas of the three 100 MW solar facilities as well as the 19.9 MW facilities (black polygon in Fig. 1) are almost entirely - or perhaps entirely - underlain by Middle to Late Permian basinal mudrocks of the **Volksrust Formation** (Ecca Group) that are

of Low to (at most) Medium Palaeosensitivity. With the possible exception of some shallow drainage lines, bedrock exposure in this area of very low relief is likely to be minimal due to pervasive soil and vegetation cover. Most of the area is already disturbed by agriculture. The south-westernmost margins of the combined solar project area *might* extend into the outcrop area of Late Permian continental sediments of the **Adelaide Subgroup** (Lower Beaufort Group) which are assigned a High to Very High Palaeosensitivity. No sizeable pans are visible on satellite images of the solar project area, while some large pans (Kommandantspan, Rietpan) are mapped outside its margins. Pan sediments are generally considered High Sensitivity.

The **132kV grid connection corridors** are largely underlain by **Quaternary aeolian sands** or sandy soils, all of Low Palaeosensitivity, with only short sectors traversing the outcrop areas of the Volksrust Formation (Low-Medium Sensitivity) and Adelaide Subgroup (High Sensitivity). For this reason, the eastern 132 kV route option to Everest Substation is *slightly* more sensitive in palaeontological heritage terms. However, the terrain over the great majority of both grid connection corridor options is of low relief, with little or no bedrock exposure, and disturbed at surface by agriculture.

The **44kV grid connection corridors** are also largely underlain by Quaternary aeolian sands with short sectors crossing the Volksrust Formation and Adelaide Subgroup outcrop areas. The western sectors of both line options are disturbed by urban development. The two route options are of very similar palaeosensitivity, with no preference between them on palaeontological heritage grounds.

### 3. Red flags/no-go areas/major sensitivities

The only sectors of the solar facility (including the larger as well as smaller projects) and grid connection project areas that are potentially of High to Very High palaeosensitivity are those, if any, that are underlain by the Adelaide Subgroup (blue-grey areas in Figure 1). However, it is likely that bedrock exposure here is very limited at best, and the sediments are weathered near surface, so these areas are *not* considered to be red flags or major sensitivities. Fossils – especially blocks of resistant-weathering petrified wood - may be eroded-out from the bedrocks into overlying eluvial or fluvial gravels and sands here. This can only be determined by specialist palaeontological ground-truthing.

### 4. Preferences for grid connections

The difference in palaeosensitivity between the two 132 kV and the two 44 kV grid connection corridors respectively is minimal. In both cases there is no preference for either one or other route option on palaeontological heritage terms.

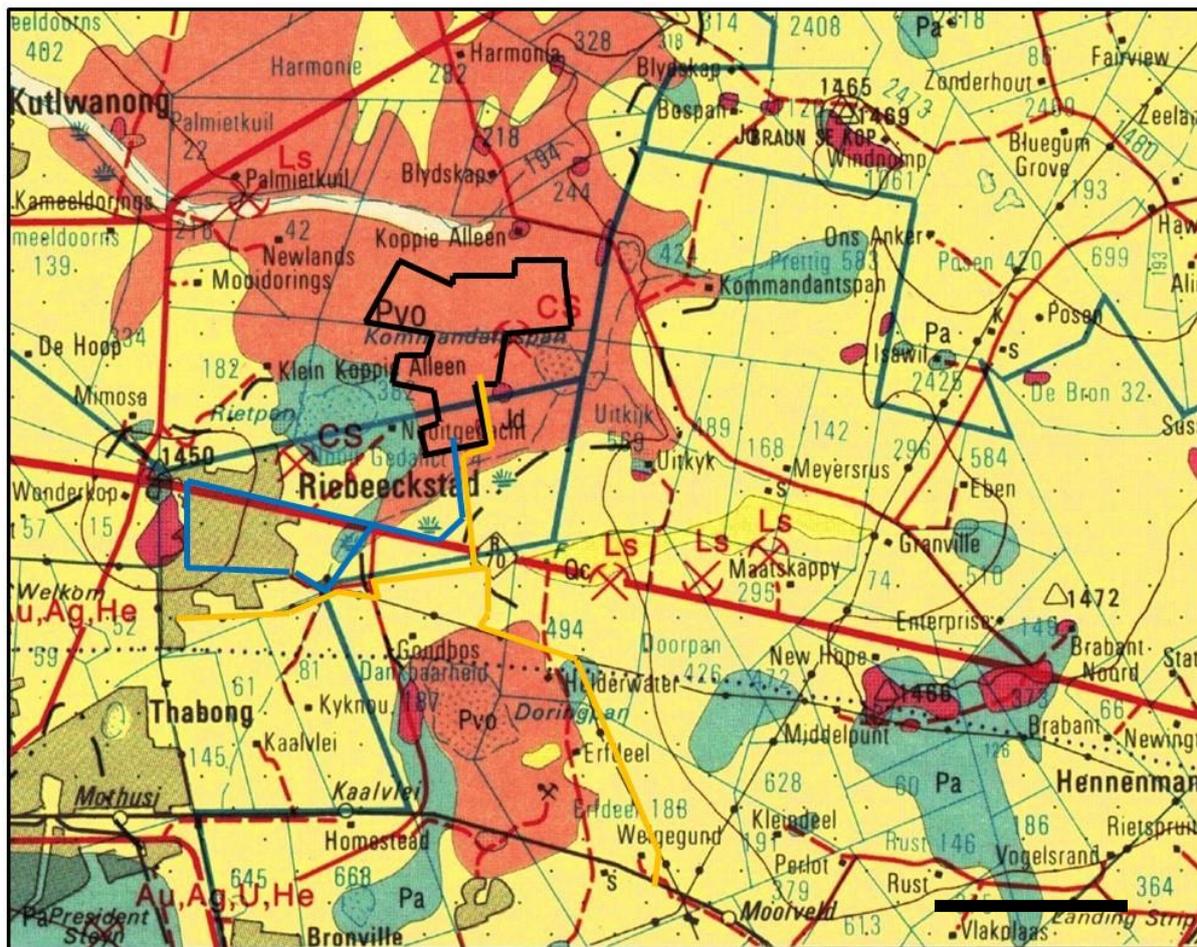


Figure 1: Extract from 1: 250 000 geological map 2726 Koonstad (Council for Geoscience, Pretoria). Scale bar = c. 4 km. N towards the top of the image. The combined large and small solar facility project areas are outlined in black. Alternative corridor options for the 132 kV and 44 kV grid connections are shown by the orange and blue lines respectively. The main rock units mapped within the Khauta solar project area include:

- Stippled area - pans
- Pale yellow (Qs) – Quaternary aeolian sands
- Dark yellow (Qc) – Late Caenozoic pedogenic calcrete
- Red (Jd) – Karoo Dolerite Suite
- Grey-blue (Pa) – Permian Adelaide Subgroup (Lower Beaufort Group)
- Orange (Pvo) – Volksrust Formation (Ecca Group)

## 5. Key references

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## 6. Short CV of 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 the University of Tübingen in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa and Madagascar. 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 numerous palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest Province, Mpumalanga, Gauteng, KwaZulu-Natal and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a 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, 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.



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