

Proposed vineyard development on Farm 355 Tierkop, Kakamas North, near Augrabies, Kai! Garib Municipality, Northern Cape

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Executive summary

The proposed agricultural development (c. 72 ha) comprises new vineyards and a small 1 MW PV solar plant on the Farm 355 Tierkop, Kakamas North, situated c. 4 km NE of Augrabies in the Kai! Garib Municipality of the Northern Cape Province. The development footprint is underlain by (1) ancient Precambrian igneous and metamorphic bedrocks that do not contain fossils as well as (2) sparsely fossiliferous or unfossiliferous superficial sediments (alluvium, aeolian sands, surface gravels) of probable Quaternary to Recent age. Ancient alluvial terraces (potentially fossiliferous “High Level Gravels”) are not mapped in the study area. In view of the small, in part disturbed development footprint and the generally low palaeontological sensitivity of the study region, no further specialist studies or mitigation are considered necessary for this project, as far as fossil heritage is concerned. However, should significant fossil remains (e.g. vertebrate bones and teeth) be encountered during construction, the responsible ECO should inform SAHRA at the earliest opportunity to consider possible mitigation measures. A tabulated Chance Fossil Finds Procedure is appended to this report.

1. Project description

The proponent Rooipad Boerdery (Pty) Ltd is proposing to establish a new agricultural development (c. 72 ha in area) on the Farm 355 Tierkop, Kakamas North, situated on the northern side of the Orange River (Gariep) some 4 km NE of Augrabies in the Kai! Garib Municipality of the Northern Cape Province (Fig. 1). The gravel road to Riemvasmaak runs along the southern edge of the study area. The proposed vineyard development will cover a footprint area of about 72 ha. A small (± 1 Megawatt) PV package plant is also envisaged (Small red triangle in Fig. 1). Water for the new vineyards will be supplied from a pump station located on the banks of the Orange River. The vineyards will be supplied with water *via* existing pipelines. Existing farm roads will be used, and no new access roads will need to be constructed.

An EIA for this agricultural development proposal is being co-ordinated by Pieter Badenhorst Professional Services (PO Box 1058, Wellington, 7654. Cell: 0827763422. Fax: 0866721916. E-mail: pbps@iafrica.com). The present report contributes to the HIA component of the EIA that is being compiled by Jonathan Kaplan of ACRM (5 Stuart Road, Rondebosch, 7700. Ph/Fax: 021 685 7589. Cell: 082 321 0172. E-mail: acrm@waccess.co.za).

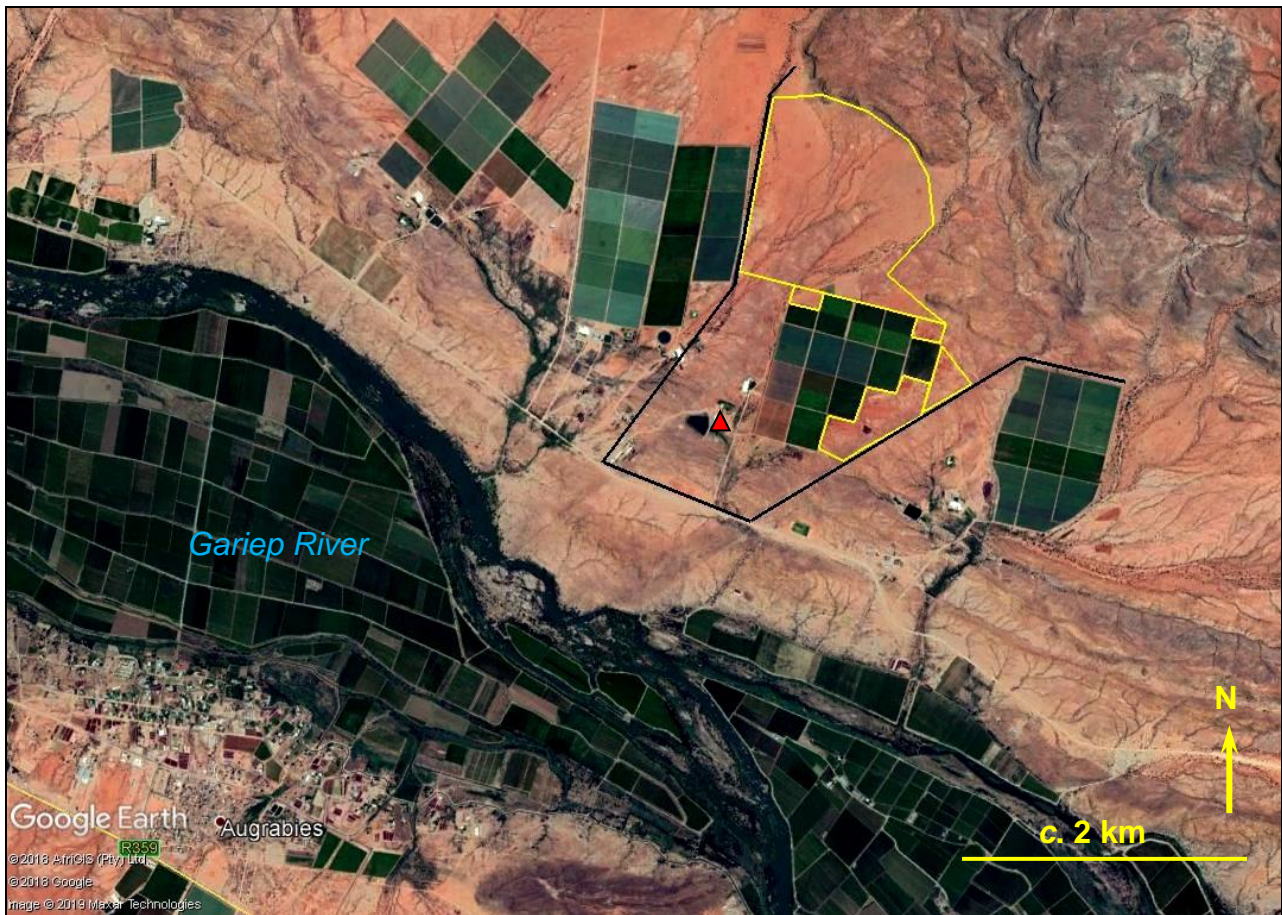


Figure 1. Google earth© satellite image showing the study site for new vineyards (yellow polygons) as well as a small 1 MW PV plant (red triangle) on the Farm 355 Tierkop, Kakamas North, situated on the northern side of the Orange River (Gariep) some 4 km NE of Augrabies, Kai! Garib Municipality of the Northern Cape Province. The PV plant site is highly disturbed.

2. Geological and palaeontological context

The agricultural project study area on Farm 355 Tierkop comprises gently sloping arid terrain between c. 660 and 715 m amsl. which stretches from about 1.0 to 3.6 km NE of the present banks of the Gariep up to the edge of a range of low basement *koppies* (Fig. 1). The area is largely mantled by orange-hues aeolian sands and sparse gravels (vein quartz, gneiss *etc*) with no extensive areas of bedrock exposure. Shallow, dendritic, ephemeral stream drainage lines feeding into the Gariep traverse the area which is also extensively disturbed by previous agricultural activities. Kaplan (2019) reports “Hard *dorbank* surfaces of gravel, and outcroppings of quartz” but these lie outside the new vineyard footprint. The proposed PV plant site is already highly disturbed.

The geological context of the study area is shown on the 1: 250 000 geology sheet 2820 Upington (Fig. 2; Council for Geoscience, Pretoria) (Moen 2007). The underlying bedrocks are ancient Precambrian granite-gneisses assigned to the **Riemvasmaak Gneiss** and **Omdraai Gneiss** of the **Namaqua-Natal Province** that are some 1.5 billion years old and entirely unfossiliferous (Cornell *et al.* 2006, Almond & Pether 2008).

The study area lies only shortly (< 4 km) north and < 70 m above the present course of the River Orange, so ancient (Tertiary - Quaternary), consolidated alluvial gravels of the Orange River system – which are known to be highly fossiliferous elsewhere along the Orange (*e.g.* Partridge *et al.* 2006) – might be present here. However, neither “High Level Gravels” nor the commonly associated diamond prospecting symbols are mapped on the Farm 355 Tierkop region on the 1:

250 000 geological sheet (Fig. 2). Superficial sediments away from the main drainage courses largely comprise surface gravels (mainly alluvial, sheetwash and deflation deposits) and reddish-hued aeolian and locally-derived sands (*cf* Kaplan 2019). The red sands may in part be assigned to the upper part of the **Kalahari Group (Gordonia Formation)** of late Caenozoic (Neogene / Quaternary) age and the remaining alluvial sediments are probably of a similar, geological youthful age. Although fossil remains are occasionally encountered in these younger fluvial and terrestrial units – for example reworked mammalian bones and teeth, freshwater molluscs, calcretised root casts, termitaria, ostrich egg shells, land snail shells (Almond 2008, Almond & Pether 2008 and refs. therein) - they are sparsely distributed and occur over a very wide area, so the chances of serious impacts on unique fossil heritage resources here are only slight.

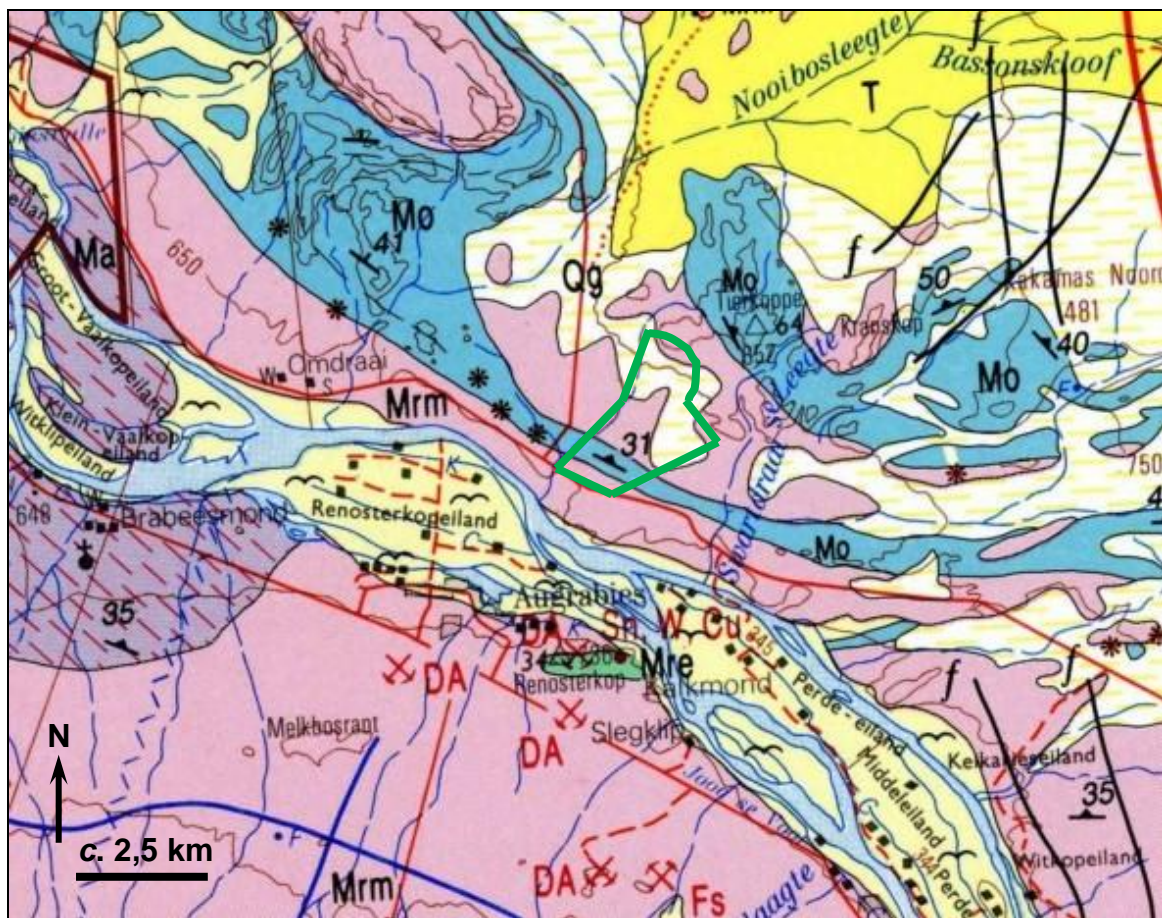


Figure 2. Extract from 1: 250 000 sheet 2820 Upington (Council for Geoscience, Pretoria) showing the geology of the Tierkop agricultural project study area (green polygon) on the northern side of the Orange River and c. 4 km NE of Augrabies, Northern Cape. Bedrocks beneath the study area comprise Riemvasmaak Gneiss (Mrm, pink) and Omdraai Gneiss (Mo, blue) forming part of the Precambrian (Proterozoic) Namaqua-Natal Metamorphic Province. Parts of the project area are mantled by orange-hued aeolian sands of the Gordonia Formation (Kalahari Group) of Quaternary to Recent age. Older alluvial gravels (“High Level Gravels”) are not mapped in this area. Prospecting for alluvial diamonds (red DA symbols) occurs south of the Orange at Augrabies but is not mapped to the north of the river in this region.

3. Conclusions & recommendations

In view of the negligible palaeontological sensitivity of the ancient Precambrian bedrocks as well as the low sensitivity of the geologically recent superficial sediments along the Orange River in the Augrabies – Kakamas North region, the proposed agricultural development – including new vineyards and small PV plant - is not considered to pose a significant threat to palaeontological heritage. Substantial, potentially-fossiliferous older alluvial deposits of the Orange River are not mapped here.

Pending any significant new fossil discoveries in the area, no further specialist studies or mitigation are considered necessary for this agricultural project.

All South African fossil heritage is protected by the National Heritage Resources Act, 1999. Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO should safeguard these, preferably *in situ*. They should then alert the relevant provincial heritage management authority as soon as possible - *i.e.* SAHRA (Contact details: Dr Ragna Redelstorff, SAHRA, P.O. Box 4637, Cape Town 8000. Tel: 021 202 8651. Email: rredelstorff@sahra.org.za). This is to ensure that appropriate action (*i.e.* recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the developer's expense. A tabulated Chance Fossil Finds Procedure is appended to this report.

These mitigation recommendations should be incorporated into the Environmental Management Programme (EMPr) for this agricultural project. Please note that:

- All South African fossil heritage is protected by law (South African Heritage Resources Act, 1999) and fossils cannot be collected, damaged or disturbed without a permit from SAHRA or the relevant Provincial Heritage Resources Agency;
- The palaeontologist concerned with potential mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection);
- All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (*e.g.* data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).

4. References

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5. 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, Limpopo, Mpumalanga, Northwest, Free State and KwaZulu-Natal under the aegis of his Cape Town-based company *Natura Viva cc*. He was 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 AHP (Association of Professional Heritage Assessment 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.



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

CHANCE FOSSIL FINDS PROCEDURE: Proposed vineyard & PV plant developments on Farm 355 Tierkop, Kakamas North, near Augrabies		
Province & region:	NORTHERN CAPE, Kai! Garib Municipality	
Responsible Heritage Resources Authority	SAHRA (Contact details: P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502)	
Rock unit(s)	Late Caenozoic alluvium, aeolian sands	
Potential fossils	Mammalian bones and teeth, freshwater molluscs, calcretised root casts, termitaria, ostrich egg shells, land snail shells	
ECO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.	
	2. Record key data while fossil remains are still <i>in situ</i> : Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo Context – describe position of fossils within stratigraphy (rock layering), depth below surface Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (<i>e.g.</i> rock layering)	
	3. If feasible to leave fossils <i>in situ</i> : Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (<i>e.g.</i> entire block of fossiliferous rock) Photograph fossils against a plain, level background, with scale Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.	
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority	
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (<i>e.g.</i> museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.	