

RECOMMENDED EXEMPTION FROM FURTHER PALAEOLOGICAL STUDIES & MITIGATION:

Rectification of agricultural developments on Farm Mosplaas (Erf 2255, 2149, 1740 & 2125 Kakamas South Settlement), Kai! Garib Municipality, Northern Cape

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EXECUTIVE SUMMARY

Citrus plantations totalling 410 ha in extent have been developed without authorization on the Farm Mosplaas (Erf 2255, 2149, 1740 & 2125 Kakamas South Settlement), situated on the south-eastern outskirts of Kakamas in the Kai! Garib Municipality of the Northern Cape. The development footprint is underlain by ancient Precambrian basement rocks belonging to the **Namaqua-Natal Province**. These basement rocks are approximately two to one billion years old and entirely unfossiliferous. They are mantled by Late Caenozoic sandy soils, surface gravels and possibly calcretes; consolidated older fluvial gravels of the Orange River system are unlikely to be represented here. The overall palaeontological impact significance of the agricultural development is considered to be LOW because:

- Most of the study area is underlain by unfossiliferous igneous or metamorphic basement rocks (granite-gneisses *etc*) or mantled by superficial sediments of low palaeontological sensitivity;
- Much of the area is already highly disturbed.

It is therefore recommended that, pending the discovery of significant new fossils on site, exemption from further specialist palaeontological studies and mitigation be granted for this development.

Should any substantial fossil remains (e.g. vertebrate bones and teeth, shells, petrified wood, calcretised burrows) be encountered during excavation, however, these should be reported to SAHRA for possible mitigation by a professional palaeontologist (Contact details: Dr Ragna Redelstorff, SAHRA, P.O. Box 4637, Cape Town 8000. Tel: 021 202 8651. Email: rredelstorff@sahra.org.za). A tabulated Chance Fossil Finds Procedure is appended to this report.

1. OUTLINE OF DEVELOPMENT

Keboes Farms (Pty) Ltd has undertaken the unauthorised development of citrus plantations totalling 410 ha in extent on the Farm Mosplaas (Erf 2255, 2149, 1740 & 2125 Kakamas South Settlement), situated on the south-eastern outskirts of Kakamas in the Kai! Garib Municipality of the Northern Cape (Figs. 1 & 2). The study site lies on the eastern side of the gravel road to Kenhardt and Loeriesfontein as well as south of the R359 from Kakamas to Upington.

The Section 24G Rectification process for this agricultural development is being co-ordinated by Groenbergenviro (Pty) Ltd (Contact details: Ms Elanie Kühn. GroenbergEnviro (Pty) Ltd,

PO Box 1058 Wellington 7654. Cell: 0765840822. E-mail: Elaniem@iafrica.com). The present report contributes to the heritage component of the process under the aegis of Mr Jonathan Kaplan of ACRM (5 Stuart Road, Rondebosch, 7700. Ph/Fax: 021 685 7589. Cell: 082 321 0172. E-mail: acrm@waccess.co.za).

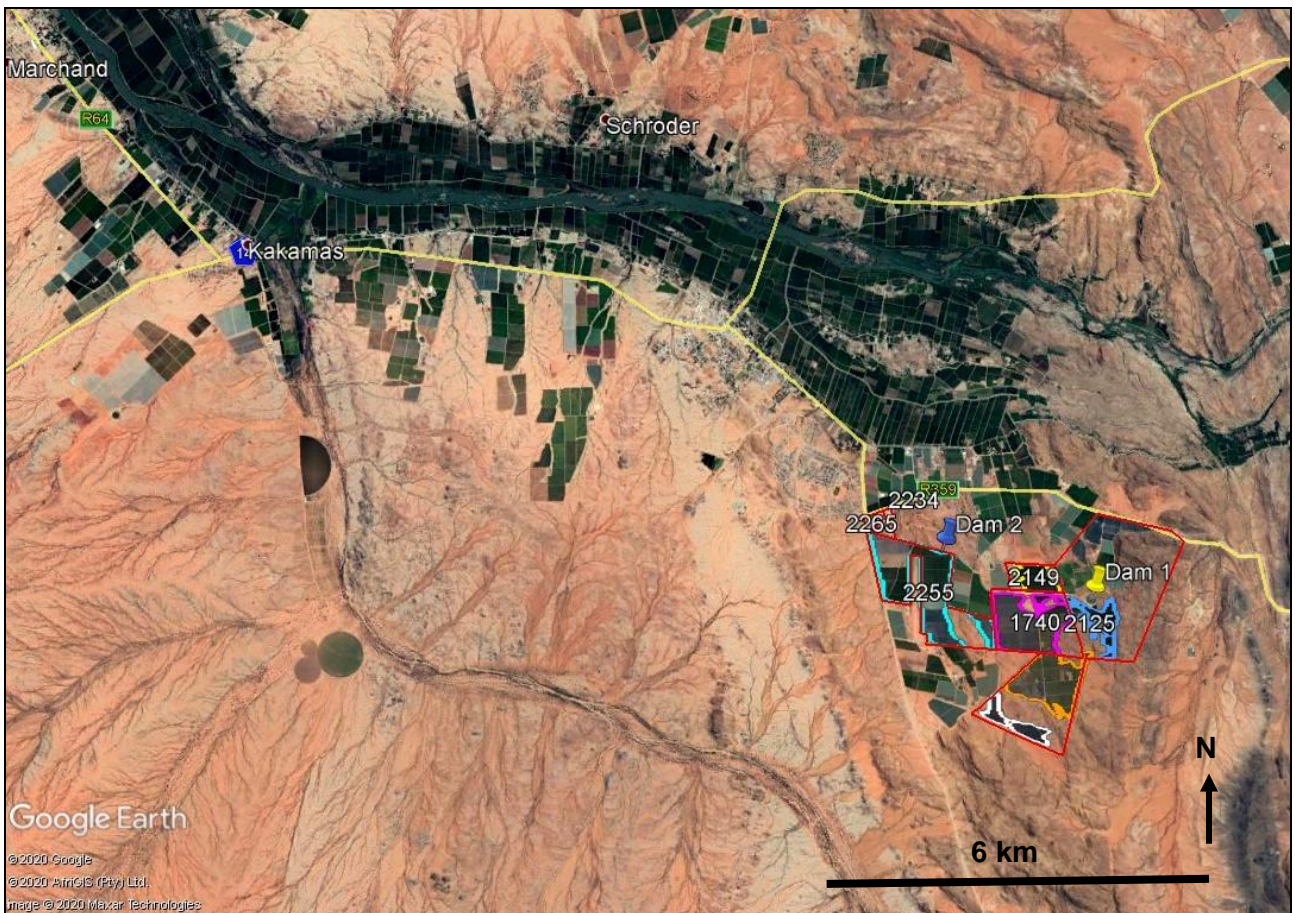


Figure 1: Google Earth© satellite image showing the location of the agricultural projects on Farm Mosplaas (Erf 2255, 2149, 1740 & 2125 Kakamas South Settlement) situated on the south-eastern outskirts of Kakamas, Kai! Garib Municipality, Northern Cape (coloured polygons).

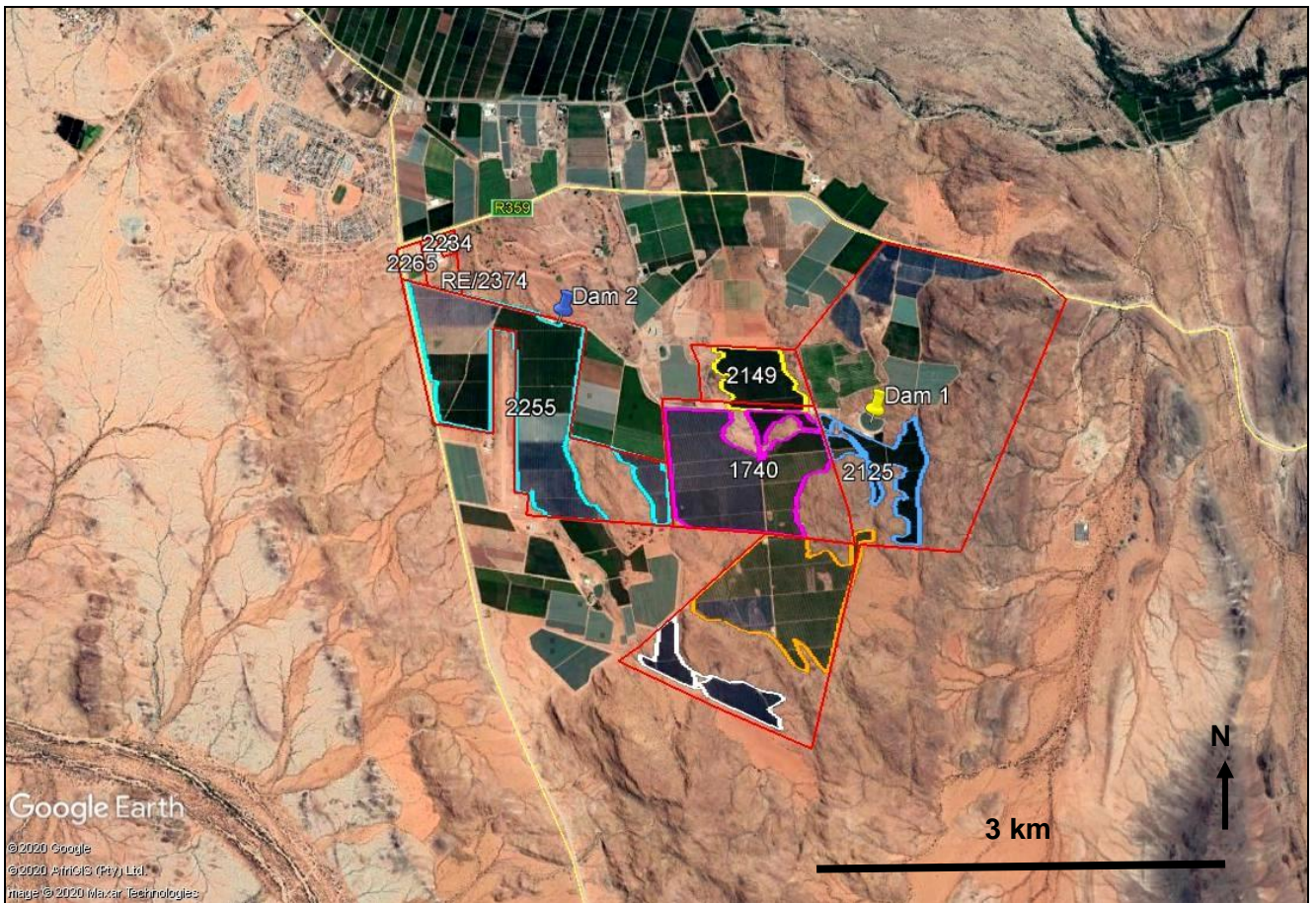


Figure 2: Google Earth© satellite image showing the agricultural projects on Farm Mosplaas in more detail.

2. GEOLOGICAL BACKGROUND

The agricultural project area on Farm Mosplaas is situated on highly disturbed (partially developed), arid, sandy to gravelly terrain at 675 to 740 m amsl on the south-eastern outskirts of the town of Kakamas, some 4 km or more south of the present course of the Orange River / Gariep (Figs. 1 & 2). The area was originally traversed by shallow, dendritic stream systems that intermittently drain northwards into the Orange River.

The geology of the study area near Kakamas is shown on the 1: 250 000 geology map 2820 Upington (Council for Geoscience, Pretoria; Fig. 3 herein). A comprehensive sheet explanation for this map has been published by Moen (2007). The agricultural development site is underlain by ancient Precambrian basement rocks – the **Riemvasmaak granite-gneiss (Mrm)** – that belong to the **Namaqua-Natal Province** of Mid Proterozoic (Mokolian) age (Cornell *et al.* 2006, Moen 2007). These basement rocks are approximately two to one billion years old and entirely unfossiliferous (Almond & Pether 2008).

The Precambrian basement rocks within the study area are mantled with a spectrum of other coarse to fine-grained **Late Caenozoic superficial deposits** such as rocky soils, downwasted surface gravels, colluvium (slope deposits), sheet wash, calcrete hardpans and alluvium of intermittently flowing streams. These deposits are generally young (Quaternary to Recent) and have been mapped as **Gordonia Formation (Kalahari Group)** aeolian sands although a colluvial and alluvial sedimentary component is also likely to have occurred here.

The study site is over 4 km away from the present course of the Orange River and elevated perhaps 20-25 m or more higher than this. According to Moen (2007) ancient river terrace gravels

occur “all along the river” within 2 km of the present banks and at elevations of up to 45 m (rarely as high as 85m) above the present flood plain. It is considered unlikely that significant deposits of Late Tertiary **Orange River alluvial gravels** are present within the study area, and none are mapped here on the 1: 250 000 Upington geology sheet.

3. PALAEOLOGICAL HERITAGE

The Precambrian metamorphic and igneous basement rocks of the **Namaqua-Natal Metamorphic Province** in the study area are entirely unfossiliferous (Almond & Pether 2008).

Alluvial gravels of the Orange River of Miocene and younger age are locally highly fossiliferous (e.g. Hendy 1984, Schneider & Marias 2004, Almond 2009 and extensive references therein) but, as argued above, these are *not* mapped within the study area and are unlikely to occur here.

The **Gordonia Formation** dune sands (Qg in Fig. 3) 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 & 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.

The palaeontological sensitivity of the Kakamas agricultural development study area is assessed as LOW.

4. CONCLUSIONS & RECOMMENDATIONS

The overall palaeontological impact significance of the agricultural developments on Farm Mosplaas (Erf 2255, 2149, 1740 & 2125 Kakamas South Settlement) is considered to be LOW because:

- Most of the study area is underlain by unfossiliferous igneous or metamorphic basement rocks (granite-gneisses *etc*) or mantled by superficial sediments of low palaeontological sensitivity;
- Much of the area is already highly disturbed.

It is therefore recommended that, pending the discovery of significant new fossils on site, exemption from further specialist palaeontological studies and mitigation be granted for this development.

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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, Limpopo, Gauteng, KwaZulu-Natal, Mpumalanga, Northwest and Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has been 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 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.



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Palaeontologist
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CHANCE FOSSIL FINDS PROCEDURE: Agricultural developments on Farm Mosplaas (Erf 2255, 2149, 1740 & 2125 Kakamas South Settlement)		
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> : <ul style="list-style-type: none"> • 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> : <ul style="list-style-type: none"> • 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): <ul style="list-style-type: none"> • <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.	