

RECOMMENDED EXEMPTION FROM FURTHER PALAEOLOGICAL STUDIES:

EXISTING LANDFILL SITE NEAR JAN KEMPDORP, LEKWA TEEMANE LOCAL MUNICIPALITY, NORTH WEST PROVINCE

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1. OUTLINE OF THE PROPOSED DEVELOPMENT

An application has been submitted for a Waste Management License for the existing Jan Kempdorp Waste Disposal Facility (WDF) which is situated approximately 4 km east of the Central Business District of Jan Kempdorp on Portion 43 of the Farm Guldenskat 36, Lekwa Teemane Local Municipality, North West Province. The footprint of the WDF site is approximately 39,245 m².

Since the landfill site overlies potentially fossiliferous bedrocks, a palaeontological heritage assessment of the project area has been requested by the South African Heritage Resources Agency (Their Case ID: 8737; Letter of Dec. 14, 2015) in accordance with the National Heritage Resources Act (No. 25 of 1999).

The present palaeontological heritage comment for the Jan Kempdorp Waste Disposal Facility has been commissioned by SE Solutions (Contact details: Ms Vici Napier. SE Solutions. Suite 51, Private Bag X108, Centurion 0046, South Africa. Cell: +27 (0)78 278 2898. Fax: +27 (0)86 664 6885. E-mail: vici.napier@outlook.com).

2. GEOLOGICAL BACKGROUND

Satellite images (Fig. 2) show that the highly disturbed Jan Kempdorp landfill study area on the eastern outskirts of town is situated in semi-arid, gently hilly terrain just south of the R506 road to Christiana and c. 20 km north of the Vaal River. A NNW-SSE range of low rocky ridges or hills of Precambrian igneous rocks runs less than 4 km to the east. The broader region is mantled in orange-hued sandy soils with Savannah vegetation.

The geology of the Jan Kempdorp area is shown on 1: 250 000 geology sheet 2724 Christiana and briefly described in the accompanying sheet explanation by Schutte (1994) (Fig. 1). The study area is underlain by ancient Precambrian bedrocks of the Ventersdorp Supergroup that are mantled here with aeolian (wind-blown) sands of the Kalahari Group.

The **Ventersdorp Supergroup** represents a major episode of Archaean igneous extrusion (LIP = Large Igneous Province) that is associated with fracturing of the Kaapvaal Craton some 2.7 Ga (billion years) ago (Van der Westhuizen *et al.* 2006). The basal lava pile termed the Klipriviersberg

Group - mainly basaltic lavas welling up in fissure eruptions, totalling up to two kilometres thick and 100 000 km² in extent - accumulated over a comparatively short period of some six million years (McCarthy & Rubidge 2005). The overlying **Platberg Group** comprises a range of felsic to mafic volcanic rocks, including lavas and pyroclastics, as well as subordinate carbonate and siliclastic sediments. The present study area overlies the **Rietgat Formation** (Rr, green with V-symbols in Fig. 1) within the upper part of the Platberg Group. According to Schutte (1994) the Rietgat Formation in the Taung – Jan Kempdorp region comprises various volcanic rock types such as lavas, tuffs, tuffites and cherts that overlie quartz porphyries of the Makwassie Formation.

Aeolian sands overlying the Precambrian bedrocks near Jan Kempdorp (Qw, pale yellow in Fig. 1) can be provisionally assigned to the **Gordonia Formation** of the Kalahari Group. These sands are of Quaternary to recent age (Thomas 1981, Dingle *et al.* 1983, Thomas & Shaw 1991, Schutte 1994, Haddon 2000 and Partridge *et al.* 2006).

3. PALAEOLOGICAL HERITAGE

The fossil heritage associated with each of the major rock units represented in the Jan Kempdorp landfill study area is briefly outlined here.

The volcanic rock units that dominate the Archaean **Ventersdorp Supergroup** succession are unfossiliferous. However, domical stromatolites (microbial mounds) are recorded from shallow water lacustrine calcarenites within the volcano-sedimentary succession of the **Rietgat Formation** at the top of the Platberg Group (Schopf 2006, Van der Westhuizen *et al.* 2006). The overlying predominantly siliclastic Bothaville Formation contains conical stromatolites (Schopf 2006). Carbonate sediments are not reported in association with the Allanridge Formation lavas at the top of the Ventersdorp Supergroup, however. Since lacustrine sediments are not reported from the Rietgat Formation in the Jan Kempdorp region, it is considered highly unlikely that fossil stromatolites are present here and the palaeontological sensitivity of the bedrocks in the study area is accordingly assessed as LOW.

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.

4. CONCLUSIONS & RECOMMENDATIONS

The predominantly volcanic basement rocks of early Precambrian age underlying the Jan Kempdorp landfill study area at depth are probably entirely unfossiliferous. The overlying Kalahari Group sediments (aeolian sands) mantling the older bedrocks are generally of low palaeontological sensitivity. It is concluded that further use of the landfill site is 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 operation of the existing waste disposal facility on Portion 43 of the Farm Guldenskat 36, Lekwa Teemane Local Municipality, North West Province, exemption from further specialist palaeontological studies and mitigation be granted for this project.

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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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, Northwest and the Free State under the aegis of his Cape Town-based company *Natura Viva cc*. He has served as 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.



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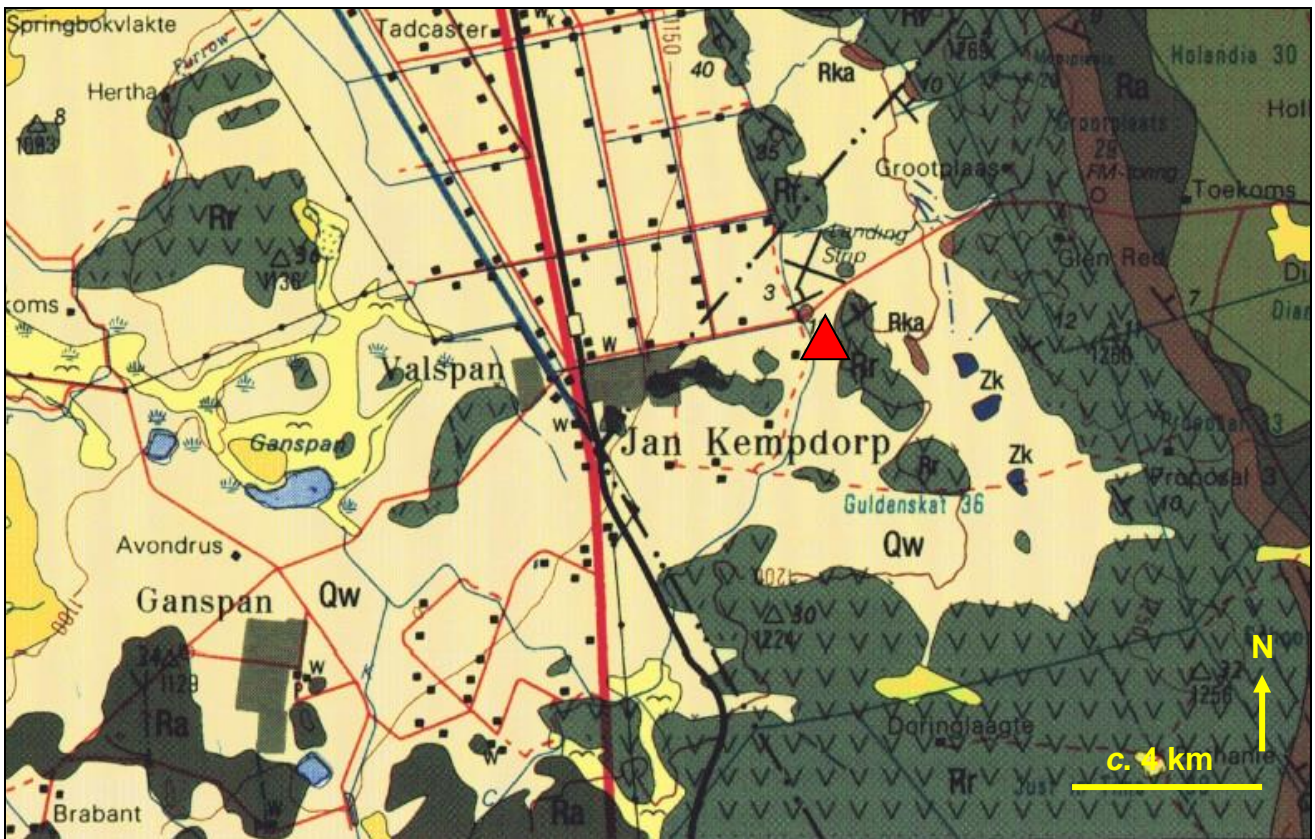


Figure 1: Extract from the 1: 250 000 geology sheet 2724 Christiana (Council for Geoscience, Pretoria) showing the location of the existing landfill site on the eastern outskirts of Jan Kempdorp, Northwest Province (red triangle). The main geological units mapped in or beneath the study area are:

1. Precambrian (Archaean) volcanic rocks of the Rietgat Formation (Platberg Group, Ventersdorp Supergroup):
Dark green with V-symbols (Rr)

3. Late Caenozoic (Quaternary to Recent) superficial deposits: reddish aeolian sands of Gordonia Formation (Kalahari Group)
Pale yellow with dots (Qw)



Figure 2: Google earth© satellite image showing the location (white polygon, arrowed) of the existing Jan Kempdorp Waste Disposal Facility (WDF), situated approximately 4 km east of the Central Business District of Jan Kempdorp on Portion 43 of the Farm Guldenskat 36, Lekwa Teemane Local Municipality, North West Province.