Proposed development at 24 Riviere near Vaalwater, Limpopo

SCOPING REPORT
PALAEONTOLOGY

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3 February 2013

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1. Introduction

The palaeontological heritage of South Africa is unsurpassed and can only be described in superlatives. The South African palaeontological record gives us insight in *i.a.* the origin of life, dinosaurs and humans. Fossils are also used to identify rock strata and determine the geological context of the geological formations and the chronostratigraphy of Southern Africa.

The first evidence of tectonic plate movement was discovered after studying the distribution of Karoo-age fossils in South Africa and other continents and subcontinents such as India, Antarctica, South America and Australia. Fossils are also used to study evolutionary relationships, sedimentary processes and palaeoenvironments.

The Heritage Act of South Africa stipulates that fossils and fossil sites may not be altered or destroyed. The purpose of this document is to detail the probability of finding fossils in the study area which may be impacted by the proposed development.

2. Terms of reference for the report

According to the South African Heritage Resources Act (Act 25 of 1999) (Republic of South Africa, 1999), certain clauses are relevant to palaeontological aspects for a terrain suitability assessment.

- **Subsection 35(4)** No person may, without a permit issued by the responsible heritage resources authority-
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.
- **Subsection 35(5)** When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may-
- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation form the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

South Africa's unique and non-renewable palaeontological heritage is protected in terms of the NHRA. According to this act, heritage resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

As areas are developed and landscapes are modified, heritage resources, including palaeontological resources, are threatened. As such, both the environmental and heritage legislation require that development activities must be preceded by an assessment of the impact undertaken by qualified professionals. Palaeontological Impact Assessments (PIAs) are specialist reports that form part of the wider heritage component of:

- Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the National Heritage Resources Act, Act No. 25, 1999 by a heritage resources authority.
- Environmental Impact Assessment process as required in terms of other legislation listed in s. 38(8) of NHRA;
- Environmental Management Plans (EMPs) required by the Department of Mineral Resources.

HIAs are intended to ensure that all heritage resources are protected, and where it is not possible to preserve them in situ, appropriate mitigation measures are applied. An HIA is a comprehensive study that comprises a palaeontological, archaeological, built environment, living heritage, etc specialist studies. Palaeontologists must acknowledge this and ensure that they collaborate with other heritage practitioners. Where palaeontologists are engaged for the entire HIA, they must refer heritage components for which they do not have expertise on to appropriate specialists. Where they are engaged specifically for the palaeontology, they must draw the attention of environmental consultants and developers to the need for assessment of other aspects of heritage. In this sense, Palaeontological Impact Assessments that are part of Heritage Impact Assessments are similar to specialist reports that form part of the EIA reports. The standards and procedures discussed here are therefore meant to guide the conduct of PIAs and specialists undertaking such studies must adhere to them. The process of assessment for the palaeontological (PIA) specialist components of heritage impact assessments, involves:

Scoping stage in line with regulation 28 of the National Environmental Management Act (No. 107 of 1998) Regulations on Environmental Impact Assessment. This involves an **initial assessment** where the specialist evaluates the scope of the project (based, for example, on NID/BIDs) and advises on the form and extent of the assessment process. At this stage the palaeontologist may also decide to compile a **Letter of Recommendation for Exemption from further Palaeontological Studies**. This letter will state that there is little or no likelihood that any significant fossil resources will be impacted by the development. This letter should present a reasoned case for exemption, supported by consultation of the relevant geological maps and key literature.

A **Palaeontological Desktop Study** – the palaeontologist will investigate available resources (geological maps, scientific literature, previous impact assessment reports, institutional fossil collections, satellite images or aerial

photos , etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area. A Desktop studies will conclude whether a further field assessment is warranted or not. Where further studies are required, the desktop study would normally be an integral part of a field assessment of relevant palaeontological resources.

A **Phase 1 Palaeontological Impact Assessment** is generally warranted where rock units of high palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large-scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed project area is unknown. In the recommendations of Phase 1, the specialist will inform whether further monitoring and mitigation are necessary. The Phase 1 should identify the rock units and significant fossil heritage resources present, or by inference likely to be present, within the study area, assess the palaeontological significance of these rock units, fossil sites or other fossil heritage, comment on the impact of the development on palaeontological heritage resources and make recommendations for their mitigation or conservation, or for any further specialist studies that are required in order to adequately assess the nature, distribution and conservation value of palaeontological resources within the study area.

A **Phase 2 Palaeontological Mitigation** involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or the recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before Phase 2 may be implemented.

A **'Phase 3' Palaeontological Site Conservation and Management Plan** may be required in cases where the site is so important that development will not be allowed, or where development is to co-exist with the resource. Developers may be required to enhance the value of the sites retained on their properties with appropriate interpretive material or displays as a way of promoting access of such resources to the public.

The assessment reports will be assessed by the relevant heritage resources authority, and depending on which piece of legislation triggered the study, a response will be given in the form of a Review Comment or Record of Decision (ROD). In the case of PIAs that are part of EIAs or EMPs, the heritage resources authority will issue a comment or a record of decision that may be forwarded to the consultant or developer, relevant government department or heritage practitioner and where feasible to all three.

3. Details of study area and the type of assessment:

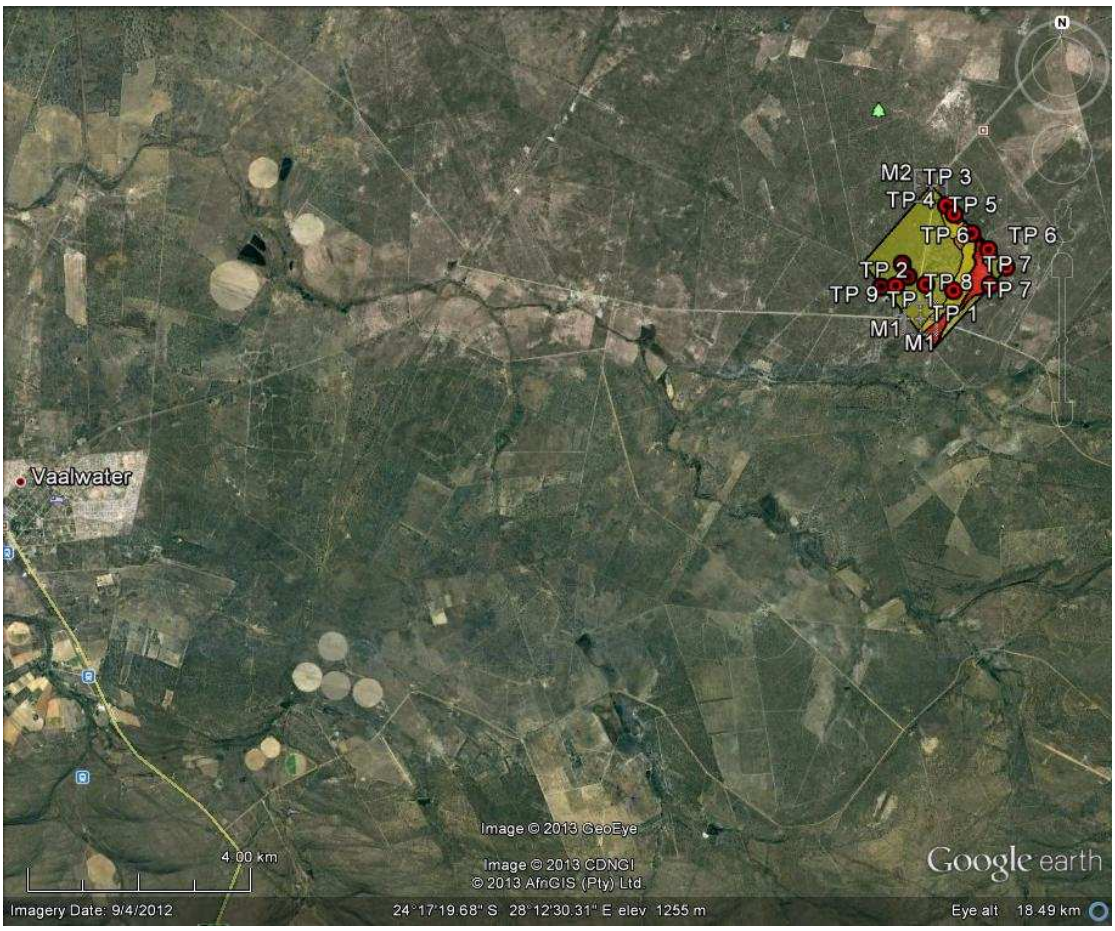


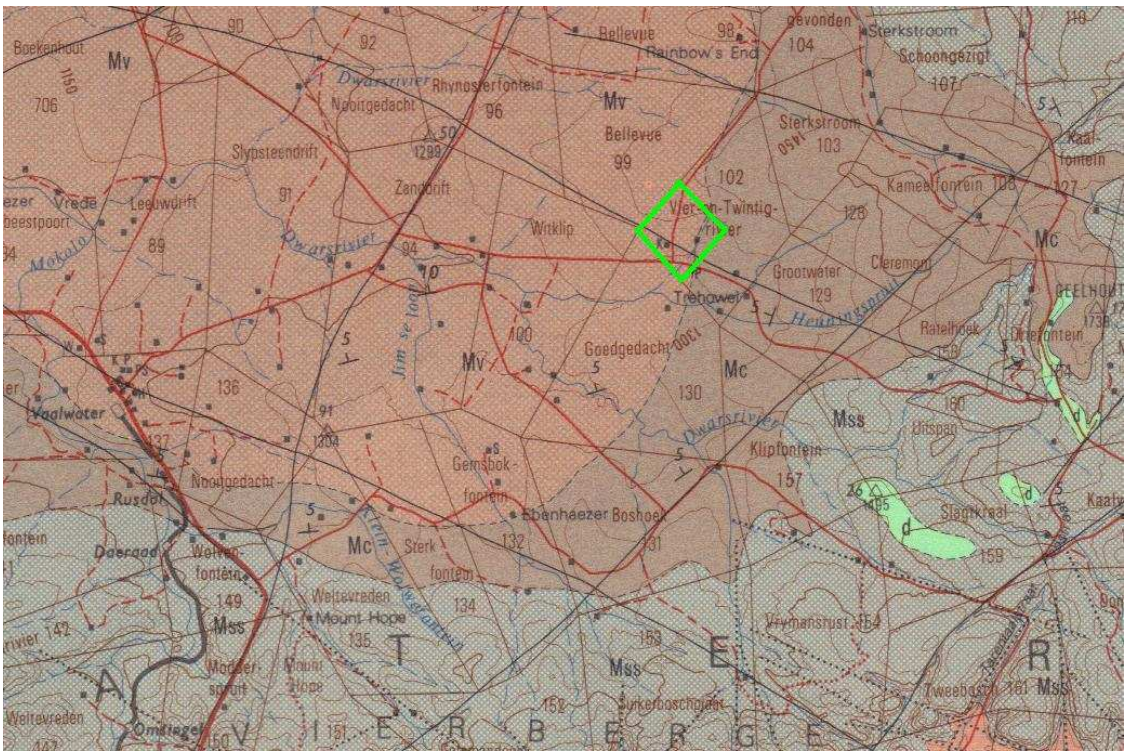
Figure 1: Google Earth photo indicating study area in the red and yellow polygon

The study area (indicated by the red and yellow polygon) lies in Limpopo Province east of the town of Vaalwater (See Fig. 1).

Geomorphologically the study area lies at the southern edge of the rugged Waterberg Massif which was eroded over hundreds of millions of years by prehistoric rivers to yield diverse bluff and butte landforms. The terrain of the study area itself slopes gently to the south and was used originally for farming. The rock formations in the area are mostly covered by sandy soils.

The relevant literature and geological maps for the region in which the development is proposed to take place, have been studied for a scoping report.

4. Geological setting of the study area and surroundings



The study area is indicated by the green polygon

GEOLOGICAL LEGEND

Legend		
	Name of geological unit	**Map description**
Mv	Vaalwater Formation, Kransberg Subgroup, Waterberg Group (Mogolian)	Fine-grained feldspathic and partly micaceous sandstone, arcose, siltstone and shale.
Mc	Cleremont Formation, Kransberg Subgroup, Waterberg Group (Mogolian)	Coarse grained white sandstone.
Mss	Sandriviersberg Formation, Kransberg Subgroup, Waterberg Group (Mogolian)	Coarse-grained yellow cross-bedded sandstone.
d		Diabase, dolerite and other intrusive igneous rocks from different ages.

Figure 2: Geological Map of the study area and surroundings (adapted from the 2428 Nylstroom 1: 250 000 Geology Map, Geological Survey, 1978)

The study area is dominated by sedimentary rocks of the Kransberg Subgroup of the Waterberg Group. The Waterberg Group is of Mogolian age (2 070 to 1 080

Mya). The Waterberg Group is predominantly arenaceous. The Vaalwater Formation is considered to be in part argillaceous however due to its clay content and partly arkosic due to its feldspar content. The Sandriviersberg Formation, which occupies the southern Waterberg plateau, grades to the east and the north into the Mogalakwena Formation which contains numerous layers of conglomerate.

5. Palaeontology of south-western Limpopo

Some of the most important fossil deposits in the south-western Limpopo include the plant fossils of the Ecca Group (Karoo Supergroup) and the Plio-Pleistocene fossils found in prehistoric cave fills in the dolomitic rocks at Makopane's Valley north of Makopane. The sedimentary rocks of the study area however are due to their age (2 070 to 1 080 Mya) devoid of macroscopic fossils.

6. Conclusion and recommendations:

The area is characterised by deep sandy soils and outcrops of the underlying geological strata are scarce in this region. The geology of the area is dominated by arenacous rocks of the Waterberg Group which is Mogolian in age (approximately 2 070 to 1 080 Mya)

Due to the improbability of fossils occurring in the study area it is recommended that the project should be exempted from further palaeontological studies. If skeletal material is found in the Quaternary alluvial deposits during construction, an archaeozoologist should be consulted.

Palaeontological specialist:
Dr JF Durand (Sci. Nat.)
BSc Botany & Zoology (RAU), BSc Zoology (WITS), Museology Dipl. (UP), Higher Education Diploma (RAU), PhD Palaeontology (WITS)

Experience:
Palaeontological assessments:

- Urban development in Cradle of Humankind World Heritage Site (Gauteng): Letamo, Honingklip, Windgat, Sundowners, Ekutheni
- Urban development at Goose Bay, Vereeniging, Gauteng
- Upgrade of R21 between N12 and Hans Strydom Drive, Gauteng
- Vele Colliery, Limpopo Province

- De Wildt 50 MW Solar Power Station, Gauteng
- 10 MW PV Plant Potchefstroom, North West Province
- Omega 342 50MW Solar Power Station, Viljoenskroon, Free State
- Solar power plant, Bethal, Mpumalanga
- Diamond mine on Endora, Limpopo Province
- Development at Tubatse Ext.15, Limpopo Province
- Manganese mine south of Hotazel, Northern Cape
- Wind energy facility at Cookhouse, Eastern Cape
- Eskom power line, Dumo, KwaZulu-Natal
- Eskom Gamma-Omega 765KV transmission line, Western Cape
- Eskom 44KV power line at Elandspruit near Middleburg, Mpumalanga

Palaeontological research:

- Gauteng: Wonder Cave
- KwaZulu/Natal: Newcastle, Mooi River, Rosetta, Impendle, Himeville Underberg, Polela & Howick Districts, Sani Pass
- Eastern Cape: Cradock District, Algoa Basin
- Western Cape: Clanwilliam District
- Free State: Memel & Warden Districts
- Limpopo Province: Nyalaland (KNP), Vhembe Reserve, Pont Drift
- Zimbabwe: Sentinel Ranch, Nottingham