Ermelo – Uitkoms 88kV line – Eskom

Msukaligwa Local Municipality, Mpumalanga Province

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Palaeontological Desktop Impact Assessment

Commissioned by: Texture Environmental Consultants

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B. Executive summary

Outline of the development project: Texture Environmental Consultants has appointed Dr H. Fourie, a palaeontologist, to undertake a Desktop Paleontological Impact Assessment of the proposed Eskom Ermelo – Uitkoms 88kV line.

Eskom Holdings (SOC) Limited plans to construct a new 20.9 km. 88kV Chickadee power line between the Ermelo and Uitkoms substations in the Msukaligwa Local Municipality in the Mpumalanga Province. Two options will be discussed. The current Ermelo-Uitkoms line will be demolished after completion of the new line.

The National Heritage Resources Act 25 of 1999 requires that all heritage resources, that is, all places or objects of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance are protected. The Republic of South Africa (RSA) has a remarkably rich fossil record that stretches back in time for some 3.5 billion years and must be protected for its scientific value. Fossil heritage of national and international significance is found within all provinces of the RSA. South Africa's unique and non-renewable palaeontological heritage is protected in terms of the National Heritage Resources Act. According to this act, palaeontological 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.

The main aim of the assessment process is to document resources in the development area and identify both the negative and positive impacts that the development brings to the receiving environment. The PIA therefore identifies palaeontological resources in the area to be developed and makes recommendations for protection or mitigation of these resources.

This report prescribes to the Heritage Impact Assessment of Section 38 of the National Heritage Resources Act 25 of 1999.

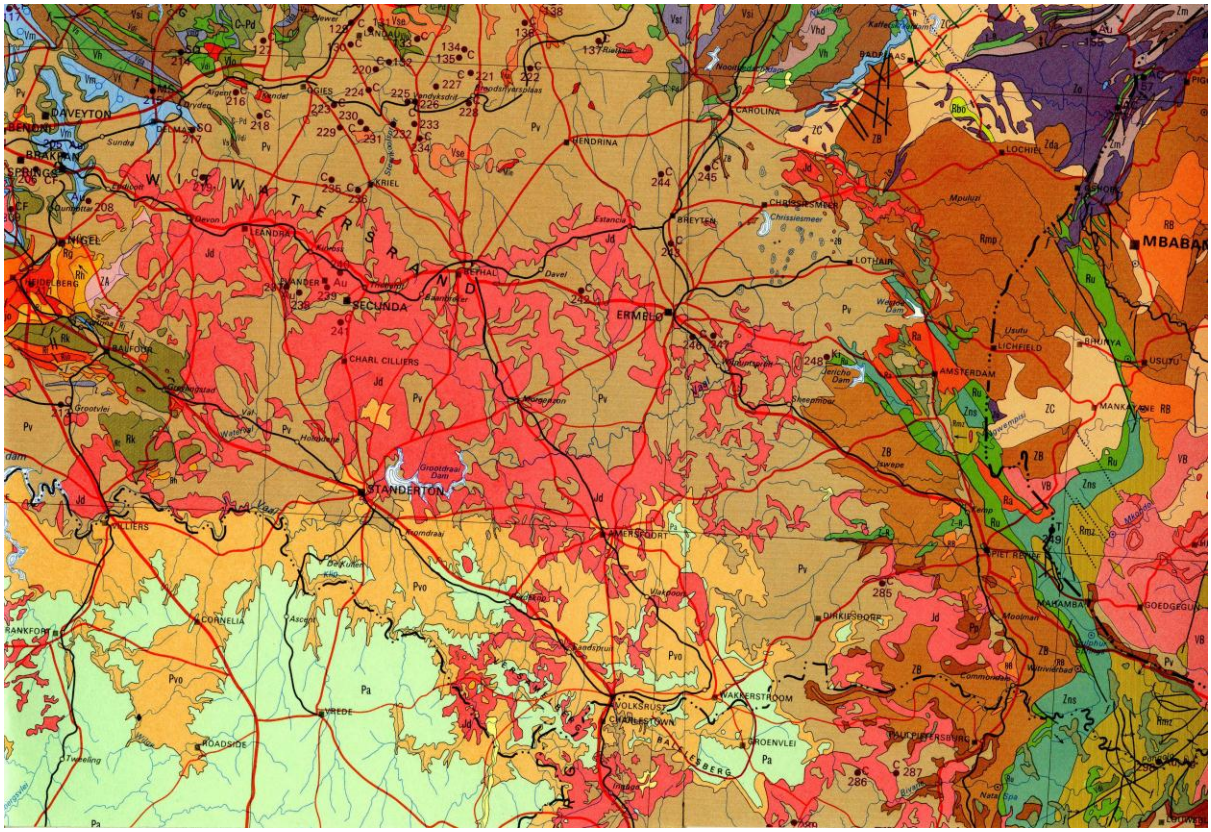
For this study, resources such as geological maps, scientific literature, institutional fossil collections, satellite images, aerial maps and topographical maps were used. It provides an assessment of the observed or inferred palaeontological heritage within the study area, with recommendations (if any) for further specialist palaeontological input where this is considered necessary.

A Palaeontological Impact Assessment is generally warranted where rock units of LOW to 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 area is unknown. The specialist will inform whether further monitoring and mitigation are necessary.

Types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act, 1999 (No 25 of 1999):
(i) (i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens.

It is proposed to comment and recommend on the impact of the development on fossil heritage mitigation or conservation necessary.

Outline of the geology and the palaeontology:
The geology was obtained from map 1:100 000, South Africa.



Legend to Map and short explanation

Pv – Vryheid Formation. Sandstone, shale and coal (brown).

Jd – Dolerite intrusive in the Karoo Supergroup (pink).

Summary of findings: The desktop palaeontological impact assessment scope and study was undertaken during March 2013 and the following is reported:

The geology of the Karoo Supergroup, Ecca Group, Vryheid Formation (Pv) consists of sandstone, shale and coal. The Karoo Supergroup covers large areas of the southern African continent. The largest basin is the area known as the Karoo, but smaller basins are located in the Lebombo area, Springbok flats and Ellisras, and north of the Soutpansberg towards Tshipise-Pafuri and further westward in Namibia.

The sediments of the Ecca Group are lacustrine and marine to fluvio-deltaic. The Ecca Group is known for its coal (mainly the Vryheid Formation) and uranium. The coalfields formed due to the accumulation of plant material in shallow and large swampy deltas. Fossils that may occur are the earliest aquatic reptile *Mesosaurus* and anthropods (Whitehill Formation), marine invertebrates (Prince Albert Formation), bivalves (Volksrust Formation), trace fossils and plants (*Glossopteris,* ferns, horsetails, clubmosses and cordaitales) (Vryheid Formation) (Johnson 2009).

South African coal is bituminous and contains about 85% carbon (McCarthy and Rubidge 2005).

The area between Ermelo and Bethal hosts an exceptional high proportion of Karoo dolerite, barren of fossils. This dolerite is often mined and used as road gravel.

Palaeontological sensitivity is MODERATE. There is evidence of mining activity past and present, mainly coal.

Recommendation: The impact of the development on fossil heritage is MODERATE and therefore a field survey or further mitigation measures will be necessary for both alternative 1 and 2. The proposed development can go ahead with first a Phase 1 Palaeontological Impact Assessment with a background study and a field survey of the proposed development and includes recommendations for conservation and the need for sampling or collection as part of a Phase 2 Palaeontological Mitigation. The mitigation process will entail the sampling, recording and collection of fossils. On occasion this may be

followed by a Phase 3 Palaeontological Site Conservation and Management plan for sites to be retained to ensure that arrangements are made for their long term maintenance and management.

Stakeholders: Developer – Eskom.
Environmental –Texture Environmental Consultants.

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D. Background information on the project

Report

This report is part of the environmental impact assessment process under the NEMA (National Environmental Management Act).

Outline of development

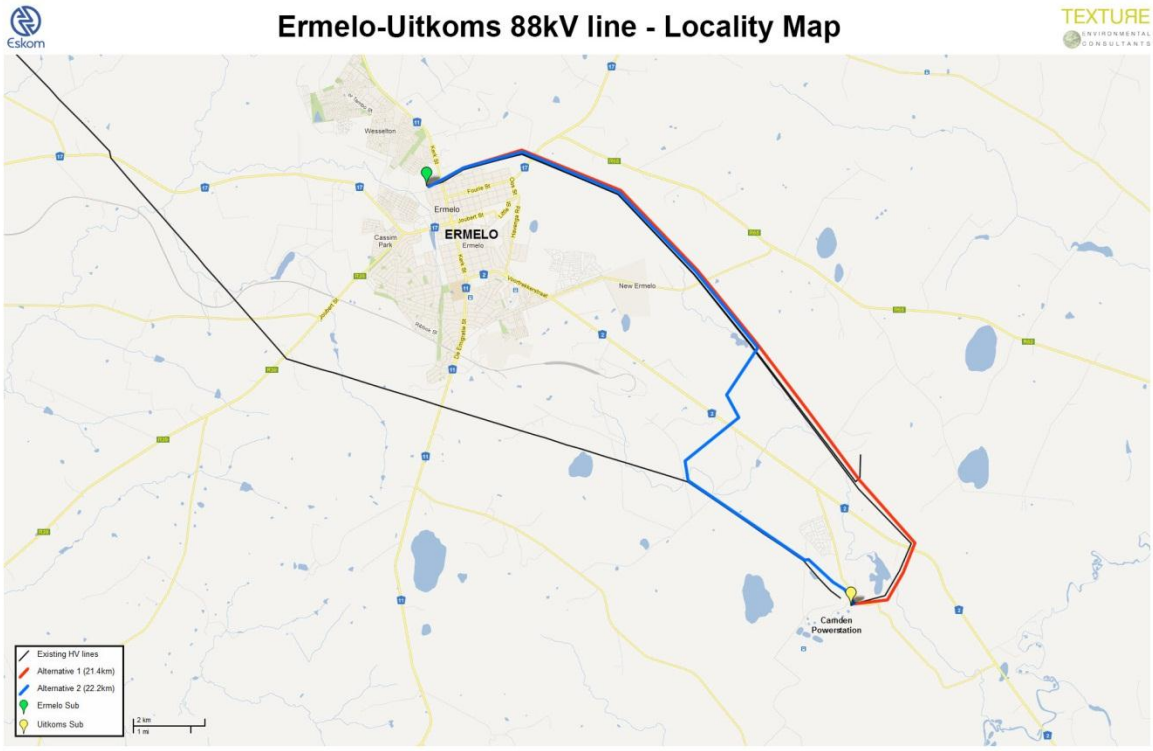
The proposed project is part of a broader scope of work to improve Eskom's network performance. The existing Distribution networks are exceeding their maximum power transfer capability. Currently the network is experiencing under voltages and is incapable of handling additional loads due to the contingency restraints of the network. As part of its assessment of a range of electricity supply options, Eskom is investigating the feasibility of constructing a new 88kV power line between the Ermelo and Uitkoms Substations.

The proposed project entails the construction of a new 88kV Chickadee Power line from the Ermelo substation located in Ermelo Town to the Uitkoms substation (approximately 20.9km) in the Msukaligwa Local Municipality in the Mpumalanga Province.

Two alternative routes will be considered for the powerline:
Alternative 1: on the farms Ermelo Town, Van Oudshoornstroom 261 IT portions 86, 27, 57, 75, 9, Rem, 12, 4, 17, 5, 1; Jan Hendriksfontein 263 IT portion 3, 4, 14; Transutu 257 IT portion 0; Jan Hendriksfontein 263 IT portion 6; Witpunt 267 IT portion 9, 22, 34; Witpunt 267 IT (consolidated to portion 40 of 267 IT) portion 1; Witpunt 267 IT portion 35 and 36; Camden Power Station 329 IT Rem. This alternative follows the existing HV line and is in total 21.4km.

Alternative 2: on the farms Ermelo Town, Van Oudshoornstroom 261 IT portions 86, 27, 57, 75, 9, Rem, 12, 4, 17, 5, 1; Jan Hendriksfontein 263 IT portion 3; Uitkomst 292 IT (Consolidated to portion 18 of 2929 IT) portion 3; Camden Power Station 329 IT Rem; Witpunt 267 IT portion 35 and 36. This alternative follows the existing line, but then cuts through to Uitkomst 292 IT before joining at Camden Power station, approximately 22.2km. The section between Jan Hendriksfontein (alternative 1, red) and Uitkomst (bottom line on map, blue) will be a new development and it is this section that may need mitigation.

Location Map:



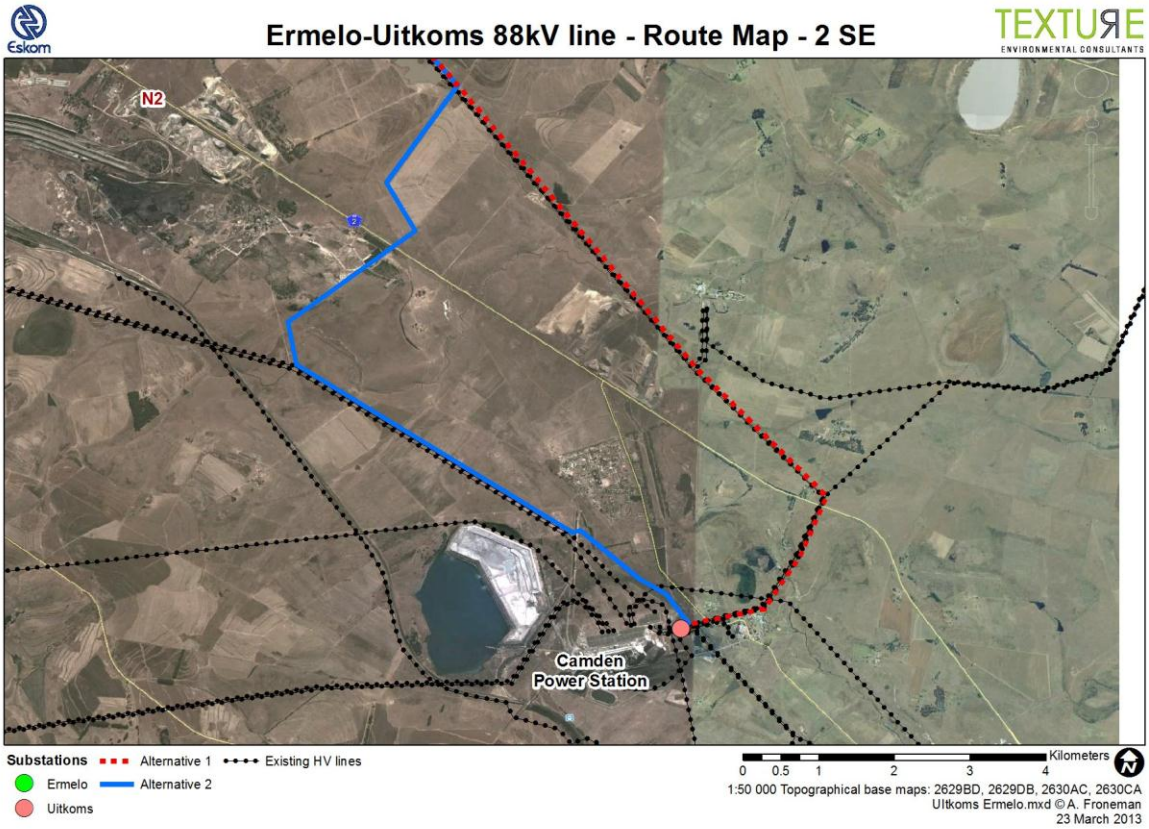
Rezoning/ and or subdivision of land: Eskom aquires the servitude.
Name of developer and consultant: Eskom and Texture Environmental Consultants.
Terms of reference: Dr H. Fourie is a palaeontologist commissioned to do a desktop palaeontological impact assessment to ascertain if any palaeontological sensitive material is present in the development area. This study will advise on the impact on fossil heritage where a field survey, mitigation or conservation may be necessary, if any.
Legislative requirements: South African Heritage Resources Agency (SAHRA) for issue of permits if necessary. National Heritage Resources Act no: 25 of 1999. An electronic copy of this report must be supplied to SAHRA.

E. Description of property or affected environment

Location:

Eskom plans to develop a new 88kV Chickadee line in the Mpumalanga Province, Msukaligwa Local Municipality between the Ermelo and Uitkoms substations. The following properties will be used for building and associated structures; Ermelo Town, Van Oudshoornstroom 261 IT portions 86, 27, 57, 75, 9, Rem, 12, 4, 17, 5, 1; Jan Hendriksfontein 263 IT portion 3; Uitkomst 292 IT (Consolidated to portion 18 of 2929 IT) portion 3; Camden Power Station 329 IT Rem; Witpunt 267 IT portion 35 and 36.

The area affected is mostly where the pylons are planted, normally between 220 – 350m apart at a depth of 2-3m deep. A road is already present. Alternative 1 follows existing pylons and part of alternative 2 also follows existing pylons, but a short section will be a new addition on alternative 2. Both alternatives will have the same impact on the palaeontology as only pylons will be planted, no new roads are required.



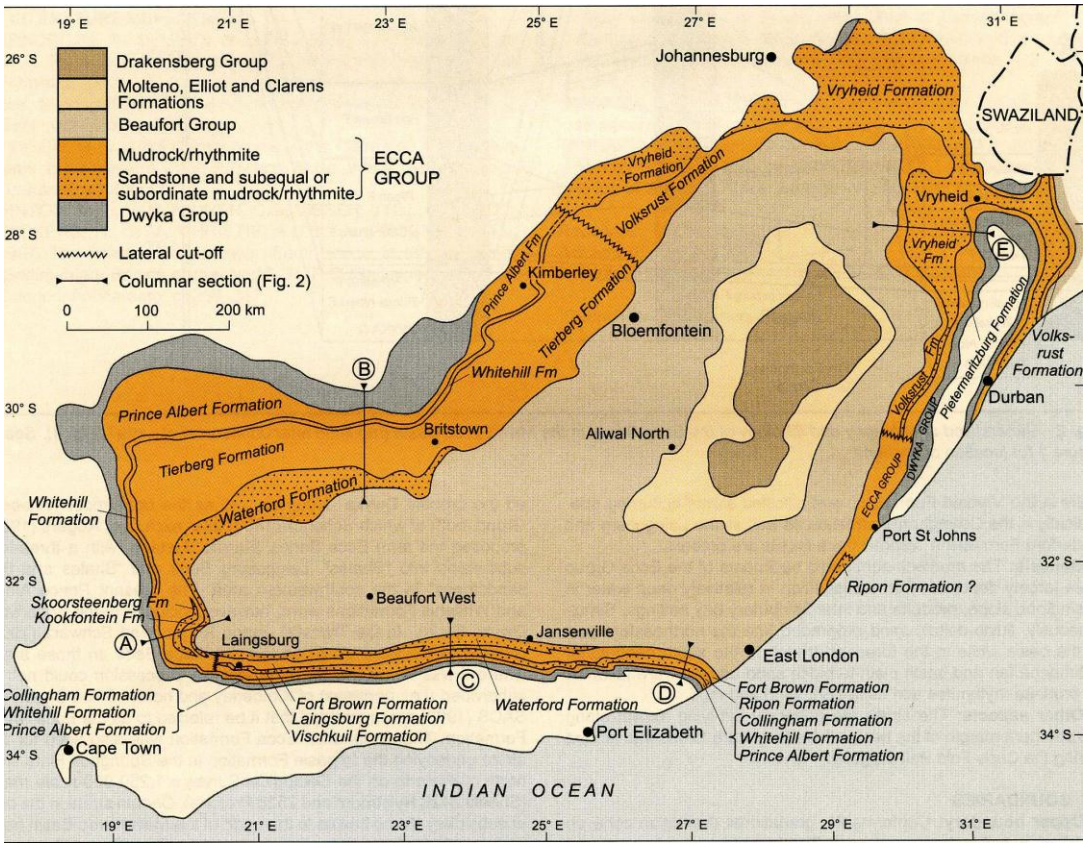
F. Description of the Geological Setting

Description of the rock units:

The development is taking place in an area covered by mostly the Vryheid Formation (Pv). Coal has always been the main energy source in industrial South Africa. It is in this part of Mpumalanga, south of the N4, that most of the coal-fired power stations are found. Eskom is by far the biggest electricity generator in Africa (Norman and Whitfield 2006).

The Ecca Group forms part of the Karoo Supergroup. It conformably overlies the Dwyka Group and is conformably overlain by the Beafort Group. It consists essentially of mudrock (shale), but sandstone-rich units occur towards the margins of the present main Karoo basin in the south, west and north-east, with coal seems also being present in the north-east (Johnson 2009). The age of the Ecca Group is Palaeozoic, Permian, approximately 545-250 Ma.

Layers of coal are sandwiched between fossil rich layers of mudstone and sandstone.



G. Background to Palaeontology of the area

Summary: When rock units of moderate to very high palaeontological sensitivity are present within the development footprint, a desk top study and or field scoping (survey) study by a professional palaeontologist is usually warranted. The main purpose of a field scoping (survey) study would be to identify any areas within the development footprint where specialist palaeontological mitigation during the construction phase may be required.

Fossils that may occur are the earliest aquatic reptile *Mesosaurus* and anthropods (Whitehill Formation), marine invertebrates (Prince Albert Formation), bivalves (Volksrust Formation), trace fossils and plants (*Glossopteris,* ferns, horsetails, clubmosses and cordaitales) (Vryheid Formation) (Johnson 2009).

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore as there is the presence of Karoo Supergroup strata the palaeontological sensitivity is generally LOW to VERY HIGH and locally MODERATE.

Databases and collections: Ditsong: National Museum of Natural History.
Impact: MODERATE. There are significant fossil resources that may be impacted by the development.

H. Description of the Methodology

The desktop palaeontological impact assessment and scope was undertaken during March 2013.
Assumptions and Limitations:-
The accuracy and reliability of the report is limited by the following constraints:

1. Most development areas have never been surveyed by a palaeontologist or geophysicist.
2. Variable accuracy of geological maps and associated information.
3. Poor locality information on sheet explanations for geological maps.
4. Lack of published data.
5. A Palaeontological Heritage Technical Report for Mpumalanga Province has not been done.

I. Description of significant fossil occurrences

The Ecca Group of the Karoo Supergroup has the sandstone prominently developed at the margin of the basin, the argillaceous rocks are laminated and flaky- or platy-weathered, red mudstones are absent, shale (mudrock) are grey and carbonaceous, and reptilian fossils are absent. The total thickness is <500m. The majority of coal reserves are present in the Vryheid Formation of the Ecca Group. Some trace fossils may occur with the plant fossils present in the coal-bearing layers. Plant remains belonging to the Permian *'Glossopteris*' flora is abundant, especially in the Vryheid formation.

All Karoo Supergroup geological formations are ranked as LOW to VERY HIGH, therefore the possible impact is potentially MODERATE for the Ecca Group.
MODERATE. Heritage value

J. Recommendation

a. There is no objection to the development of the construction of the new 20.9km 88kV Chikadee powerline between substations Ermelo and Uitkomst. It may be necessary to perform a Phase 1 Palaeontological Impact Assessment to determine whether the planting of pylons will affect fossiliferous outcrops as the palaeontological sensitivity is MODERATE. A Phase 2 Palaeontological Mitigation may be required taken into account the overall palaeontological impact is LOW to VERY HIGH depending on the outcome of the Phase 1 Palaeontological Impact Assessment.
b. This project will benefit the mining activities, the growth of the city of Ermelo and social development in general.
c. Preferred choice: Alternative 1 or 2 as both have equal impact and mostly follow the existing HV lines.
d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

Sampling and collecting:
Wherefore a permit is needed from the South African Heritage Resources Agency (SAHRA).

a. Objections: None.
b. Conditions of development: See final Recommendation (J)
c. Areas that may need a permit: Vryheid Formation fossils.
d. Permits for mitigation: Yes needed from SAHRA.

K. Conclusions

a. All the land involved in the development was assessed and none of the property is unsuitable for development.
b. All information needed for the Desktop Palaeontological Impact Assessment and scope was provided by Texture Environmental Consultants, Ms R. Pretorius.
c. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency are discussed.
d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures. Especially shallow caves.
e. Condition in which development may proceed: It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment and adjacent areas as well as for safety and security reasons.

L. Bibliography

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Dr Fourie obtained a Ph.D from the Bernard Price Institute for Palaeontological Research, University of the Witwatersrand. Her undergraduate degree is in Geology and Zoology. She specialises in vertebrate morphology and function concentrating on the Therapsid Therocephalia. For the past eight years she carried out field work in the Eastern Cape. Dr Fourie has been employed at the Ditsong: National Museum of Natural History in Pretoria (formerly Transvaal Museum) for 17 years.

Declaration

I, Heidi Fourie, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project for which I was appointed to do a palaeontological scope. There are no circumstances that compromise the objectivity of me performing such work.

Hfourie

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Heidi Fourie
2013/04/05