RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES & MITIGATION:

PROPOSED WOLSELEY WIND ENERGY FACILITY NEAR WOLSELEY, WESTERN CAPE

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1. SUMMARY

The Wolseley wind energy facility study area near Wolseley in the Tulbagh Valley, Western Cape, is underlain by Late Precambrian sediments of the Malmesbury Group (Porterville Formation) that are widely mantled by superficial sediments (soils, alluvium, colluvium, silcretes) on the valley floor and foothill slopes of the Waaihoekberge towards the east. The overall impact significance of the proposed wind energy facility near Wolseley is considered to be LOW because:

- The Precambrian bedrocks of the Malmesbury Group are highly deformed and deeply weathered, so any original fossil assemblages here have been destroyed;

- The superficial sediments present at or near surface are generally of low palaeontological sensitivity. Fossil remains here tend to be rare and highly localised

It is therefore recommended that exemption from further specialist palaeontological studies and mitigation be granted for this wind energy development.

However, should any substantial fossil remains (e.g. vertebrate bones and teeth, shells, peat horizons or lenses) be encountered during development, such as within fresh excavations, these should be safeguarded, if possible, in situ. These fossil find should then be reported by the responsible Environmental Control Officer to Heritage Western Cape for recording, sampling and, where appropriate, further mitigation by a professional palaeontologist.

2. OUTLINE OF PROPOSED DEVELOPMENT

The proposed Wolseley wind energy facility is situated in the Tulbagh Valley between the towns of Wolseley (approximately 9 km to the north) and Worcester (approximately 27 km to the southeast) within the Tulbagh and Worcester Magisterial Districts of the Western Cape. The R43 tar road and railway line between Wolseley and Worcester traverse the western portion of the site. A 400 kV Eskom power line runs from west to east across the valley. It is anticipated that farming will continue on the site, with the exception of the areas affected by the access roads and the foundations of the wind turbines.

The main components of the project will include:

- Approximately 20-35 wind turbines (hub height c. 90m and blade length c. 90m) with permanent red marker lights;
• 6 m wide access roads to the site and turbines (to be determined once the position of the turbines is established);
• A temporary construction camp.

At present it is anticipated that no new fencing and no new transmission line servitudes are therefore required. The wind farm will be connected to the substation via underground cables. It is anticipated that the wind farm will be decommissioned after 20 years.

The present palaeontological heritage comment has been commissioned by Arcus Gibb Engineering and Science as part of a comprehensive Heritage Impact Assessment of the proposed development (Contact details: Mr Jan-Willem De Jager, Arcus Gibb Engineering & Science, 14 Kloof Street, Cape Town, 8001; Tel: +27 21 469 9100; Cell: +27 83 578 0190; E-mail: jdejager@gibb.co.za).
Fig. 1. Location of the study area for the proposed wind energy facility in the Tulbagh Valley between Wolseley and Worcester. The R43 tar road and railway line between Wolseley and Worcester run approximately north-south across the western portion of the area. The Waaihoekberge lie on the eastern edge of the area.
3. GEOLOGICAL BACKGROUND

The Wolseley wind energy facility study area largely comprises flat to undulating agricultural ground on the Tulbagh Valley floor at around 270-290m amsl extending onto the lower western flank of the rugged Waaihoeksberge up to 700m amsl. The main course of the Breede River skirts around the area to the north and west.

The geology of the study area is shown on 1: 250 000 geology sheet 3319 Worcester (Council for Geoscience, Pretoria) and is shown here in Fig. 2. A short sheet explanation has been published by Gresse & Theron (1992; see also the older 1: 125 000 Worcester- Hermanus map and sheet explanation by De Villiers et al. 1964).

![Fig. 2. Extract from 1: 250 000 geological map 3319 Worcester (Council for Geoscience, Pretoria) showing the approximate location of the proposed wind energy facility study area in the Tulbagh Valley between Wolseley and Worcester (red polygon). A more accurate outline of the development area is shown in Fig. 2 below. The main rock units mapped within the study area include:]

Npo (brown) = Porterville Formation (Malmesbury Group)
Qg (yellow) = light grey to pale red sandy soil
Triangular symbols = colluvial deposits (mainly scree)

The study area is underlain at depth by Late Precambrian metasediments (i.e. metamorphosed sediments) of the Malmesbury Group, and in particular the Porterville Formation (Npo in Fig. 2). Brief descriptions of the Malmesbury Group in the Tulbagh Valley are given by Gresse and Theron (1992). Due to the recessive weathering of most Malmesbury Group rocks, the topographically subdued, gently hilly outcrop area features very few natural exposures of fresh bedrock.

The Porterville Formation consists largely of interbedded phyllitic shale and greywackes that were probably deposited in a submarine fan setting. These rocks were extensively deformed, resulting in intense folding, faulting, quartz veining and cleavage development, as well as regional
metamorphosed during the Late Proterozoic to Cambrian Saldanian Orogeny (mountain-building event). The more pelitic (clay-rich) Malmesbury rocks have additionally suffered extensive chemical weathering under humid tropical conditions during Cretaceous and Tertiary times so that fresh bedrock is almost universally covered with a deep mantle of multi-hued, kaolinitic and ochreous saprolite (in situ weathered rock) and surface gravels (sometimes silcretized). These features are illustrated in Figs. 3 and 4, abstracted from a previous palaeontological impact assessment by Almond (2010), showing Porterville Formation rocks in the Tulbagh Valley and the type area of the formation near Porterville.

The Malmesbury Group bedrocks are extensively mantled by superficial sediments that are probably of Pleistocene to Recent age for the most part, although older, Late Tertiary deposits may be present locally. On the valley floor, i.e. the western half of the study area, these are mapped as light-grey to pale-red sandy soils (Qg) that are largely derived from weathering of nearby Table Mountain Group rocks and merge laterally with scree and alluvial sediments (Gresse & Theron 1992). These last authors mention (ibid., p. 47) that the deposits of sandy soil between Worcester and Wolseley are particularly extensive. Older alluvial gravels of the ancient Breede River drainage system may be present at depth here. Gresse and Theron (1992, p. 48) mention that older alluvium-infilled channels of the Breede River system have been intersected in boreholes near the mountains where they are overlain by younger alluvial and colluvial deposits. A geophysical study by Van Zijl et al. (1981) demonstrated 20 to 40m of bouldery and sandy alluvial deposits, largely of local (i.e. Table Mountain Group) origin, between Wolseley and Worcester.

The foothills and lower slopes of the Waaihoeksberge are covered by various colluvial sediments, including coarse rocky scree, hillwash and debris flow deposits. These are mapped over much of the eastern portion of the study area (triangular symbols). It is likely that lower Table Mountain Group sediments are hidden beneath the surface colluvium towards the eastern edge of the area.

Fig. 3. Roadcutting through deeply-weathered pelitic metasediments of the Porterville Formation (Malmesbury Group) east of Wolseley, Tulbagh Valley. The ochreous Malmesbury rocks here are overlain by a thin (1m or less) resistant capping of silcretized alluvial gravels of the Breede River drainage system (Hammer = 26cm) (From Almond 2010).
Recent research shows that the Malmesbury Group rocks are actually of Late Proterozoic (Ediacaran) age and are therefore potentially fossiliferous (Belcher & Kisters 2003, Gresse et al. 2006, Almond 2008, 2010). Groups of fossils that may have originally been preserved within siliciclastic or minor carbonate sediments here include trace fossils, stromatolites, organic-walled microfossils (e.g. acritarchs) as well as the enigmatic vendobiontans. However, extensive deformation, including intense folding, faulting, quartz veining and cleavage development, as well as regional metamorphism during the Late Proterozoic to Cambrian Saldanian Orogeny (mountain-building event) have probably obliterated most organic remains, with the possible exception of microfossils. Micropalaeontological analysis of these difficult rocks is now in progress (G. Germs, pers. comm. 2008).

The superficial sediments (soil, scree, gravels, silcretes etc) mapped in the study area are likely to be at most sparsely fossiliferous. This applies especially to the coarser scree and other colluvial sediments in the eastern portion of the study area. Subsurface peat layers probably associated with past wetlands or vleis have been recorded within Quaternary sandy soils in the Worcester sheet area (Gresse & Theron 1992, p. 47) and are of considerable scientific interest (e.g. for palaeoclimatic and vegetation history studies). Older alluvial sediments, especially the finer-grained sands and silts, may contain important fossil remains of Quaternary mammals (e.g. bones, teeth, horn cores).

The overall palaeontological sensitivity of the Wolseley wind energy facility study area is assessed as LOW, but rare, localized pockets of high sensitivity – such as peat bodies or bone-rich gravels - may be present in the subsurface.

4. CONCLUSIONS & RECOMMENDATIONS
The overall impact significance of the proposed Wolseley wind energy facility near Wolseley is considered to be LOW because:

- The Precambrian bedrocks of the Malmesbury Group here are highly deformed and deeply weathered, so any original fossil assemblages have been destroyed;

- The superficial sediments present at or near surface are often thick and generally of low palaeontological sensitivity. Fossil remains here tend to be rare and highly localised

It is therefore recommended that exemption from further specialist palaeontological studies and mitigation be granted for this wind energy development.

However, should any substantial fossil remains (e.g. vertebrate bones and teeth, shells, peat horizons or lenses) be encountered during development, such as within fresh excavations, these should be safeguarded, if possible in situ. These fossil find should then be reported by the responsible Environmental Control Officer to Heritage Western Cape for recording, sampling and any appropriate further mitigation by a professional palaeontologist.

5. REFERENCES


DE VILLIERS, J., JANSEN, H. & MULDER, M.P. 1964. Die geologie van die gebied tussen Worcester en Hermanus. Explanation to geology sheets 3319C (Worcester) and 3419A (Caledon) and parts of 3318D (Stellenbosch) and 3418B (Somerset West), 68 pp, 2 pls. Council for Geoscience, Bellville.


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 under the aegis of his Cape Town-based company *Natura Viva* cc. He is 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 as well as Limpopo, Free State and Gauteng 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.

\[Signature\]

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