RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES:

PROPOSED 132 kV POWERLINE, WALMER, PORT ELIZABETH, NELSON MANDELA BAY MUNICIPALITY, EASTERN CAPE

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1. OUTLINE OF PROPOSED DEVELOPMENT

The Nelson Mandela Bay Municipality (NMBM) Electricity Directorate proposes to develop a double circuit 132 kV powerline from the existing Lorraine 132 KV substation to the new substation on the eastern side of William Moffet drive in the suburb of Walmer, Port Elizabeth, Eastern Cape. The proposed powerline route is approximately 2.8 km long and will cross private properties as well as NMBM owned land. Self-supporting steel monopoles or the 'Petechane' design will be used for the overhead line. A 25 m-wide servitude is required for the 132 kV overhead line to the substations. Where it is not possible to supply the substation from an overhead line, 132 kV underground cables will be used (See Fig. 2).

A Basic Assessment for this powerline project is being conducted by SRK Consulting (South Africa) Pty Ltd., Port Elizabeth, who have commissioned this palaeontological heritage comment (Contact details: Mr Luc Strydom. SRK Consulting. Ground Floor, Bay Suites, 1a Humewood Rd, Humerail, Port Elizabeth, 6001. P O Box 21842, Port Elizabeth, 6000. Tel: +27-041-5094800. Fax: +27-041-5094850. Email: lstrydom@srk.co.za).

2. GEOLOGICAL BACKGROUND

The Walmer powerline corridor traverses open, gently sloping terrain between built-up areas overlying the southern coastal plain between elevations of *c*. 100 to 145 m amsl, with a general slope to the east. Rocky outcrops are not visible on satellite images (Fig. 2).

The geology of the Port Elizabeth region has been outlined by Toerien and Hill (1989) and Le Roux (2000) and is shown in map Figure 1 below, abstracted from the 1: 50 000 geology map 3425BA Port Elizabeth (Council for Geoscience, Pretoria). As shown on the map, the western and central portions of the powerline corridor are underlain by coastal aeolianites (ancient, wind-blown dune sands) of the **Nanaga Formation** (**Algoa Group**) of Pliocene to Early Pleistocene age. These ancient dune sands crop out extensively to the west and east of Port Elizabeth (Le Roux 1992). In the present study area they unconformably overlie Palaeozoic sandstones and quartzites of the **Peninsula Formation** (**Table Mountain Group**) that crop out near-surface in the eastern portion of the study area (Op, pale blue in map Fig. 1). This Ordovician succession was laid down by

braided streams and comprises cross-bedded sandstones and quartiztes with occasional mudrock intervals and thin, pebbly conglomerates (Thamm & Johnson 2006).

The Nanaga beds comprise calcareous sandstones and sandy limestones that often display large scale aeolian cross-bedding - well seen, for example, in deep N2 roadcuts between Colchester and Grahamstown. They may reach thicknesses of 150 m or more (Maud & Botha 2000). The Nanaga aeolianites are normally partially to well-consolidated, although unconsolidated sands also occur west of Port Elizabeth (Le Roux 2000). The upper surface of the aeolianites weathers to calcrete and red, clay-rich soil, and the dune sands themselves may be profoundly reddened. The age of the palaeodunes decreases towards the modern coastline, reflecting marine regression (relative sea level fall) during the period of deposition. The oldest outcrops located furthest from the modern coast are the most elevated, having experienced some 30 m of uplift in the Pliocene, and may even be Miocene in age (Roberts *et al*., 2006). Typically the ancient dunes are preserved as undulating ridges of rounded hills trending parallel to the modern shoreline (Le Roux 1992).

3. PALAEONTOLOGICAL HERITAGE

The palaeontological record of the rock units represented in the powerline study area has been reviewed by Almond (2010; see numerous references therein).

Fossils in the **Peninsula Formation** consist only of a small range of trace fossils (burrows, trackways *etc*) and organic-walled microfossils associated with the occasional marine-influenced mudrock intervals, which are usually very poorly exposed at surface. Low-diversity trace fossil assemblages have been recorded from a Peninsula Formation succession near Humansdorp (Almond 2012). The Table Mountain Group sediments in the Eastern Cape have often suffered high levels of tectonic deformation, compromising preservation of fossils, especially within the less resistant mudrock horizons. The palaeontological sensitivity of the Peninsula Formation here, as well as of the overlying superficial sediments (downwasted gravels, colluvium, soils, pedocretes *etc*) is considered to be generally LOW (Almond *et al.* 2008).

The sparse palaeontological record of the Pliocene to Early Pleistocene **Nanaga Formation** is summarised by Le Roux (1992) and Almond (2010). The fossil biota consists of fragmentary marine shells, foraminifera (shelled protozoans), and a small range of terrestrial snails (*eg Achatina, Tropidophora, Trigonephrus, Natalina*). Dense arrays of calcretised rhizoliths (root casts) commonly occur in these and contemporary Plio-Pleistocene aeolianites along the southern and southwestern coast. A wider range of terrestrial fossils might be found here in future, albeit only rarely due to extensive post-depositional diagenesis (*e.g.* solution and repreciptation of carbonate by groundwater). They might include mammal remains from hyaena lairs, such as are recorded from contemporary Langebaan Formation aeolianites in the SW Cape (Roberts *et al.*, 2006 and refs therein). The overall palaeontological sensitivity of the Nanaga Formation is assessed as LOW, although pockets of locally HIGH sensitivity may occur locally.

4. CONCLUSIONS & RECOMMENDATIONS

The proposed 132 kV powerline development between the existing Lorraine and 17th Avenue Substations, Walmer, Port Elizabeth is of LOW significance in terms of local palaeontological heritage since (1) the sedimentary rocks underlying the site are of low palaeontological sensitivity, and (2) the project footprint is very small, with little bedrock excavation envisaged.

It is therefore recommended that exemption from further specialist palaeontological studies and mitigation be granted for this 132 kV powerline development.

Should any substantial fossil remains (*e.g.* vertebrate bones and teeth, petrified wood, plant or trace fossil assemblages, fossil shells) be encountered during excavation, however, these should be safeguarded, preferably *in situ*, and reported by the ECO to ECPHRA (*i.e.* The Eastern Cape Provincial Heritage Resources Authority. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za) and a suitably qualified palaeontologist so that specimens can be examined, recorded and, if necessary, professionally excavated at the developer's expense.

5. KEY REFERENCES

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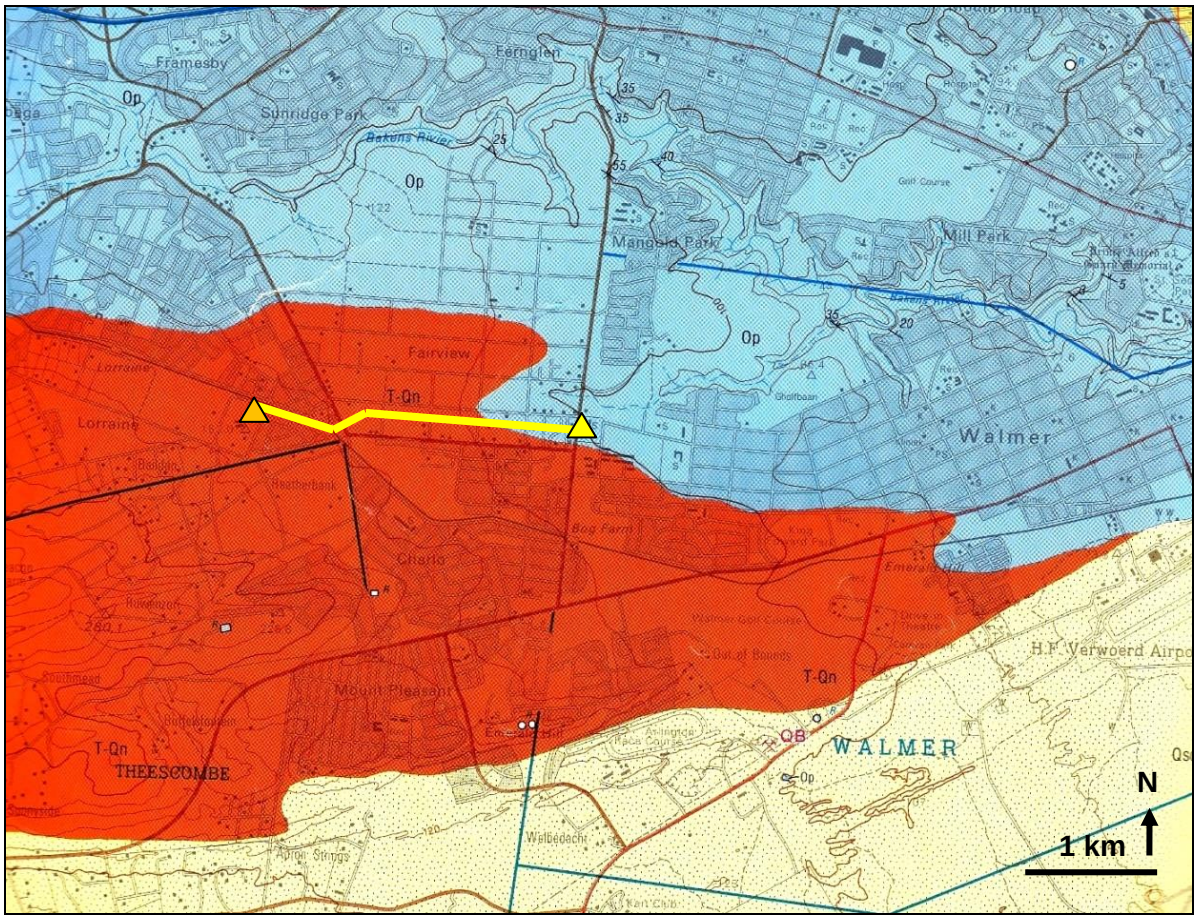

Figure 1: Extract from 1: 50 000 geology map 3425BA Port Elizabeth (Council for Geoscience, Pretoria) showing the approximate alignment of the proposed new 132 kV powerline in the suburb of Walmer, Port Elizabeth (yellow line) between Lorraine Substation in the west (orange triangle) and 17th Avenue Substation in the East (yellow triangle). The western and central portions of the study area are underlain by Plio-Pleistocene aeolian sands of the Nanaga Formation (Algoa Group) (T-Qn, orange) that overlie Palaeozoic quartzites and sandstones of the Peninsula Formation (Table Mountain Group) (Op, pale blue). The latter crop out near surface in the east.

Figure 2: Satellite image showing the location of the study area for the proposed 132 kV powerline between the existing Lorraine and 17th Avenue Substations in the Port Elizabeth suburb of Walmer, Nelson Mandela Bay Municipality, Eastern Cape (Image kindly supplied by SRK Consulting, PE).

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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