

PALAEONTOLOGICAL HERITAGE: LETTER OF EXEMPTION FROM FURTHER SPECIALIST STUDIES & MITIGATION

Proposed construction of a communications mast on the Remainder of Farm Elandsheuwel No. 146 near Hanover, Umsobomvu Municipality, Northern Cape Province

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EXECUTIVE SUMMARY

It is proposed to construct a 55 m high telecommunications mast and associated infrastructure on a dolerite ridge on the Remainder of Farm Elandsheuwel No. 146 near Hanover in the Umsobomvu Municipality, Northern Cape Province. The project footprint is largely underlain by Karoo dolerite that here intrudes Late Permian continental sediments of the Balfour Formation (Adelaide Subgroup, Karoo Supergroup). The palaeontological heritage impact significance of the proposed is assessed as VERY LOW because:

- The Karoo dolerites underlying the mast footprint are entirely unfossiliferous;
- The total project footprint – including short access road and powerline - is small and partially disturbed, while substantial bedrock excavations are not envisaged here;
- The Balfour Formation bedrocks to the NE of the *koppie* are largely mantled by doleritic colluvium and likely to be weathered near-surface;
- The overlying Pleistocene or younger colluvial gravels, calcrete and soils are generally of low palaeontological sensitivity.

Given the very low impact significance of this development in terms of palaeontological heritage resources, no recommendations for specialist palaeontological monitoring or mitigation are made here, pending the potential discovery of significant new fossils (e.g. vertebrate bones and teeth) during development. There are no objections on palaeontological heritage grounds to authorization of this development. A protocol for Chance Fossil Finds is appended to this report.

1. Project outline and brief

It is proposed to construct a 55 m high telecommunications mast and associated infrastructure on the Remainder of Farm Elandsheuwel No. 146 near Hanover in the Umsobomvu Municipality, Northern Cape Province. The site (31° 15' 19.72" S, 24° 45' 04.19" E) is located approximately 140 m from the N10 trunk road between Hanover and the N9, some 36.4 km SE of Hanover and 21 km WSW of Noupoot (Fig. 1).

A new 3 m wide gravel access road will be constructed from the existing gravel road to gain access to the proposed site (Fig. 2). The total development footprint is approximately 100 m², including a 55 m high lattice mast with antennas situated on the top of the proposed structure. The mast's base station will be enclosed with a steel palisade fence. Electricity to power the mast will be sourced from

an existing Eskom line. A new overhead line of approximately 420 m will be constructed from the Eskom line to the site.

The present Palaeontological Heritage Comment will contribute to the Heritage Assessment (HIA) component of the Basic Assessment Report for this development in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended. The over-arching HIA is being conducted by Mr Jonathan Kaplan of ACRM (5 Stuart Road, Rondebosch, 7700. Ph/Fax: 021 685 7589. Cell: 082 321 0172. E-mail: acrm@waccess.co.za).

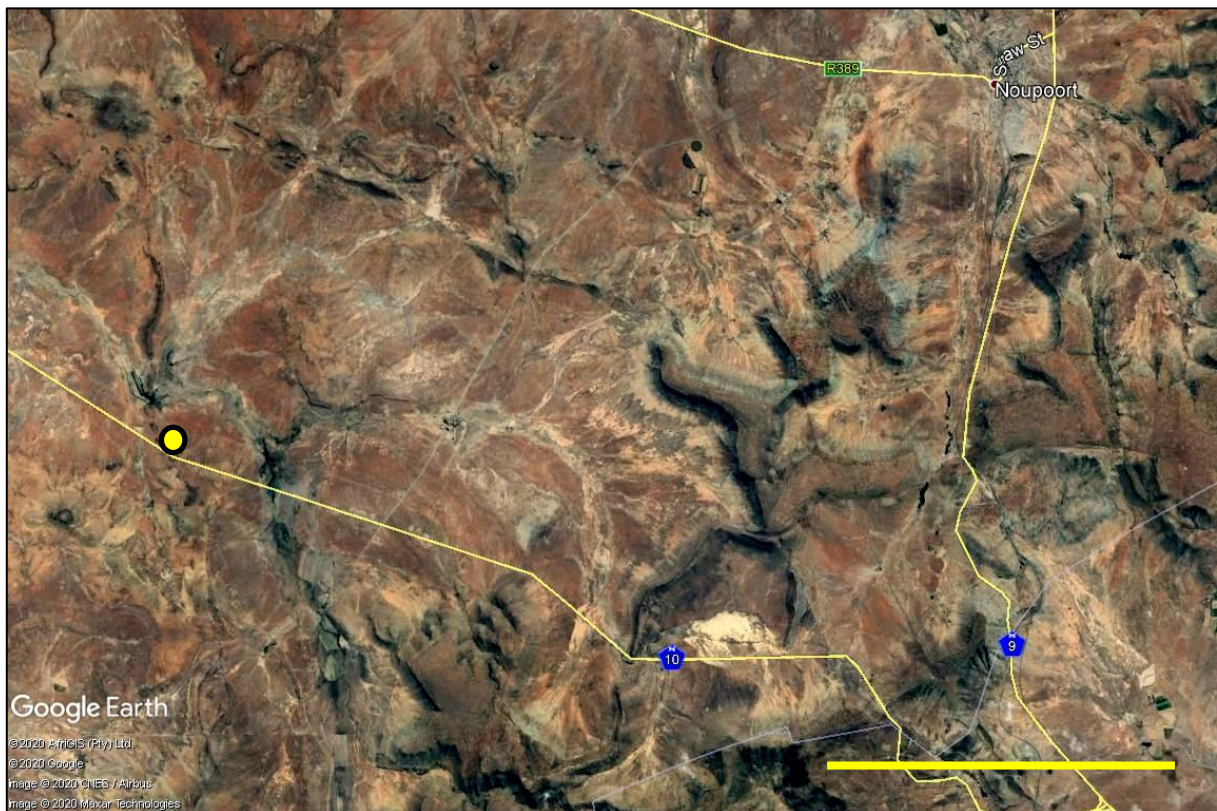


Figure 1: Google Earth© satellite image showing the location (yellow circle) of the proposed communications mast adjacent to the N10 trunk road on the Remainder of Farm Elandsheuwel No. 146, c. 36.4 km SE of Hanover and 21 km WSW of Noupoort in the Umsobomvu Municipality, Northern Cape Province. Scale bar = 8 km. N towards the top of the image.

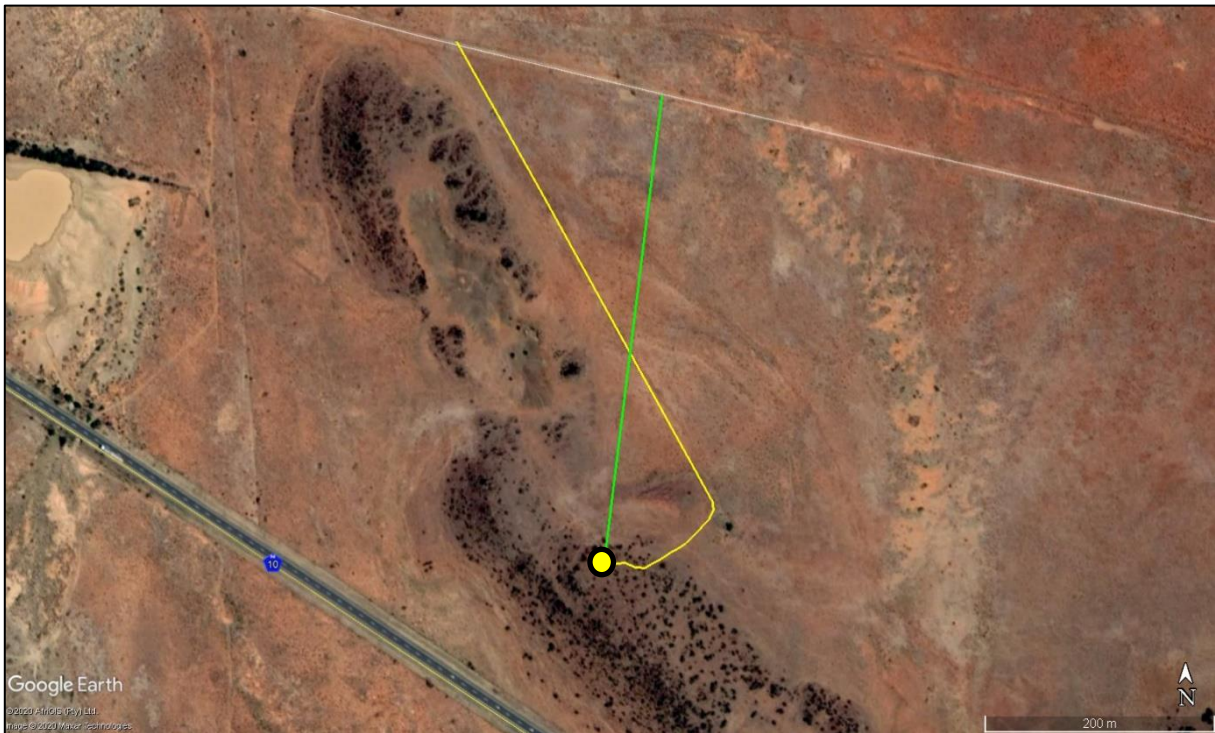


Figure 2: Google Earth© satellite image showing the location of the proposed communications mast on a dolerite *koppie* just north of the N10 (yellow circle), the new access road from the north (yellow line), and the new overhead electricity line (green line) (Image abstracted from the draft Basic Assessment report by EnviroAfrica CC). Scale bar = 200 m.

2. Geological setting

The geology of the communications mast project area is shown on 1: 250 000 sheet 3124 Middelburg (Cole *et al.* 2004) (Fig. 3). The rock units represented here have been treated in several previous palaeontological assessment studies for the Noupoot – Hanover area by Almond (2012, 2017a, 2017b, 2017c) and Butler (2016).

The mast site is situated on the crest of a low (*c.* 1470 m amsl), NW-SE trending elongate ridge of dolerite of the Early Jurassic **Karoo Dolerite Suite** (Duncan & Marsh 2006) which forms part of a complex network of narrow dolerite intrusions in the region, as clearly seen on the geological map. Field images show that the crest of the *koppie* is capped by downwasted, rusty-brown, bouldery dolerite rubble while the slopes of the *koppie* are mantled with **doleritic colluvial gravels** (orange-brown on satellite images), and probably also by interstitial calcrete. On the north-eastern slopes of the *koppie* that are traversed by the power line and access road the colluvial gravels are underlain by Permian continental (fluvial / lacustrine) sediments of the **Adelaide Subgroup** (Lower Beaufort Group, Karoo Supergroup (Rubidge (Ed.) 1995, Johnson *et al.* 2006). These sedimentary bedrocks are not identified to formation level on the Middelburg geological map but, judging by their proximity to the Early Triassic Katberg Formation outcrop area, they belong largely or entirely to the upper part of the **Balfour Formation** of Latest Permian age.

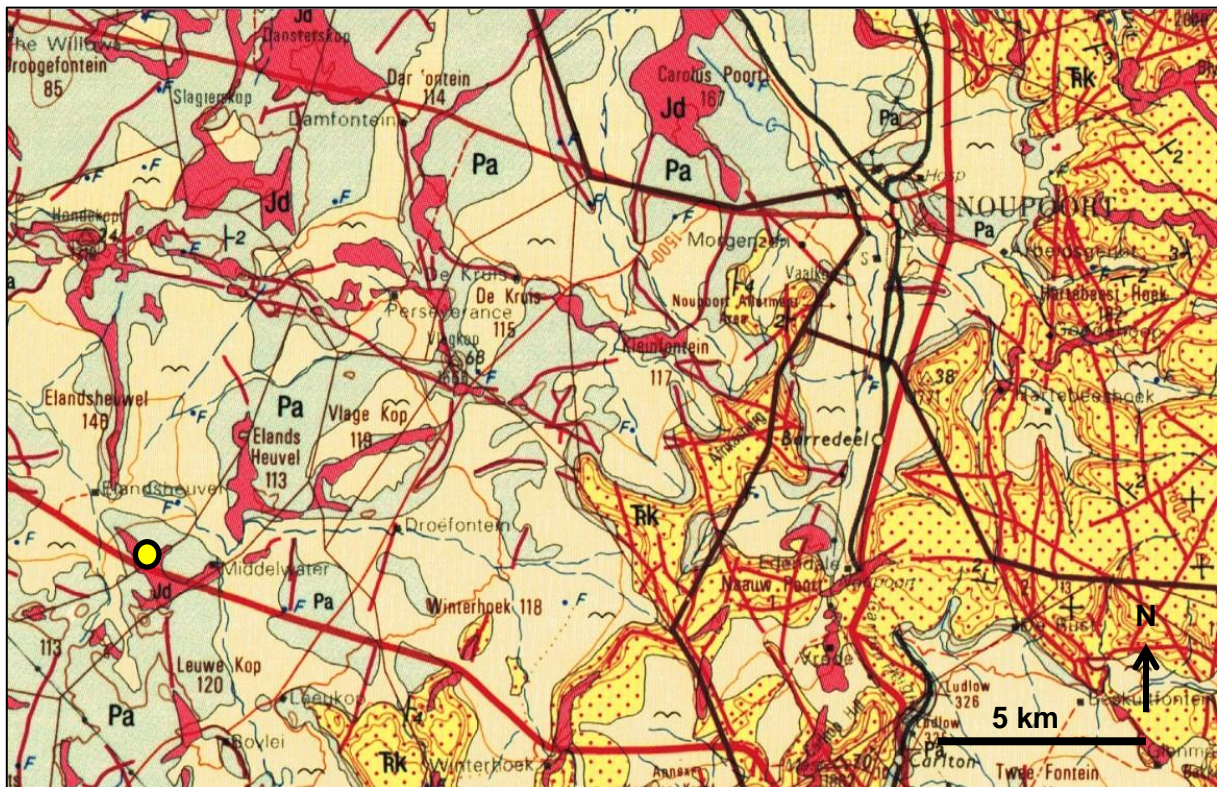


Figure 3: Extract from 1: 250 000 geological sheet 3024 Middelburg (Council for Geoscience, Pretoria) showing the geology of the project area between Noupoort and Hanover, Northern Cape. The following main rock units are mapped in the area: green (Pa) = Adelaide Subgroup (Lower Beaufort Group); pink (Jd) = intrusive dykes and sills of the Karoo Dolerite Suite; pale yellow = Pleistocene to Recent superficial deposits (alluvium, colluvium etc).

3. Palaeontological heritage

The **Karoo dolerites** building the *koppie* where the communications mast will be situated are entirely unfossiliferous igneous rocks. The coarse, rubbly **doleritic colluvial deposits** and **calcrete** mantling the majority of the project footprint are of very low palaeontological sensitivity.

The Late Permian **Balfour Formation** sedimentary rocks underling the access road and overhead powerline footprints on the NE slopes of the *koppie* are known elsewhere to contain rich assemblages of Late Permian continental biotas including a wide range of fossil vertebrates, plant material and trace fossils (*cf* Rubidge (Ed.) 1995, Johnson *et al.* 2006, Smith *et al.* 2102). They are considerable palaeontological interest since they record the catastrophic end-Permian mass extinction event and ensuing biotic recovery among continental biotas in the Main Karoo Basin (*e.g.* Smith & Ward 2001, Smith *et al.* 2002, Retallack *et al.* 2003 and 2006, Ward *et al.* 2005, Smith & Botha 2005, Smith & Botha-Brink 2014, Smith *et al.* 2012) (See also PIA reports for the Noupoort – Hanover region by 2012, 2017a, 2017b, 2017c, Butler 2016). However, due to near-surface weathering of the Karoo sediments beneath the colluvial cover as well as the small, shallow footprint of the short access road and powerline footprints, impacts on palaeontological heritage here are likely to be Very Low, at most.

4. Conclusions and recommendations

The palaeontological heritage impact significance of the proposed communications mast development on the Remainder of Farm Elandsheuwel No. 146 near Hanover is assessed as VERY LOW because:

- The Karoo dolerites underlying the core mast footprint are entirely unfossiliferous;
- The total project footprint – including access road and powerline - is small and partially disturbed, while substantial bedrock excavations are not envisaged here;
- The Balfour Formation bedrocks to the NE of the *koppie* are largely mantled by doleritic colluvium and likely to be weathered near-surface;
- The overlying Pleistocene or younger colluvial gravels, calcrete and soils are generally of low palaeontological sensitivity.

Given the very low impact significance of this development in terms of palaeontological heritage resources, no recommendations for specialist palaeontological monitoring or mitigation are made, pending the potential discovery of significant new fossils (e.g. vertebrate bones and teeth) during development. There are no objections on palaeontological heritage grounds to authorization of this development.. A protocol for Chance Fossil Finds is appended to this report.

5. Key references

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5. 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, Mpumalanga, Northwest, Free State and KwaZulu-Natal under the aegis of his Cape Town-based company *Natura Viva* cc. He was 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 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.



Dr John E. Almond
Palaeontologist
(Natura Viva cc)

APPENDIX - CHANCE FOSSIL FINDS PROCEDURE: Communications mast on Farm Elandsheuwel No. 146 near Hanover	
Province & region:	NORTHERN CAPE: Umsobomvu Municipality
Responsible Heritage Resources Agency	SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za)
Rock unit(s)	Balfour Formation (Late Permian) sediments, Pleistocene – Holocene colluvium and soils.
Potential fossils	Vertebrate bones, teeth, plant material (incl. silicified wood), trace fossils in the Balfour Formation. Calcretised trace fossils, reworked petrified wood in Pleistocene and younger colluvial and alluvial deposits.
ECO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> • Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo • Context – describe position of fossils within stratigraphy (rock layering), depth below surface • Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (<i>e.g.</i> rock layering)
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation • Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume
	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> • <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (<i>e.g.</i> entire block of fossiliferous rock) • Photograph fossils against a plain, level background, with scale • Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags • Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (<i>e.g.</i> museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.