RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES:

Proposed Boshof - Les Marais / Buitenfontein Solar Energy Facility, Farm Les Marais 137 near Boshof, Free State Province

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November 2013

1. OUTLINE OF PROPOSED DEVELOPMENT

The company Bluewave Capital SA (Pty) Ltd is proposing to develop a photovoltaic solar energy facility of 5 MW generation capacity, to be known as the Boshof - Les Marais / Buitenfontein Solar Energy Facility, at a site some 5 km southeast of the town of Boshof, Free State. The development footprint of less than 20 ha is to be located on the Farm Les Marais 137, Tokologo Local Municipality within the broader Lejeweleputswa District Municipality. The proposed PV site is situated adjacent to the Bosplaat Rural 66/22kV Substation which is located on Portion 3 of the farm Merriesfontein 70. The coordinates of the centre point of the site are: 28° 33′ 50″ S, 25° 17′ 35″ E (Fig. 1).

The main infrastructural components of the proposed PV solar energy facility include:

- PV array;
- Cabling between the project components, to be lain in trenches *c*. 1-2 m deep;
- Power inverters between the PV arrays (± 4.5 m^2);
- Power lines to evacuate the power into the Eskom grid *via* the Bosplaat Rural substation;
- Internal access roads (up to 7 m wide);
- Water storage facilities / reservoirs (1 000 m^3);
- Office, workshop area for maintenance and storage (50 m^2);
- Temporary infrastructure such as temporary housing and a laydown area (*c*. 1 ha) during construction.

This palaeontological heritage assessment comment for the proposed solar energy facility was commissioned by Heritage Contracts and Archaeological Consulting CC (HCAC) (Contact details: Mnr Jaco van der Walt. Postnet Suite No. 426, Private Bag X4, Wierda Park, 0149. E-mail: contracts.heritage@gmail.com. Tel: 012 771 3137. Fax: 086 691 6461).

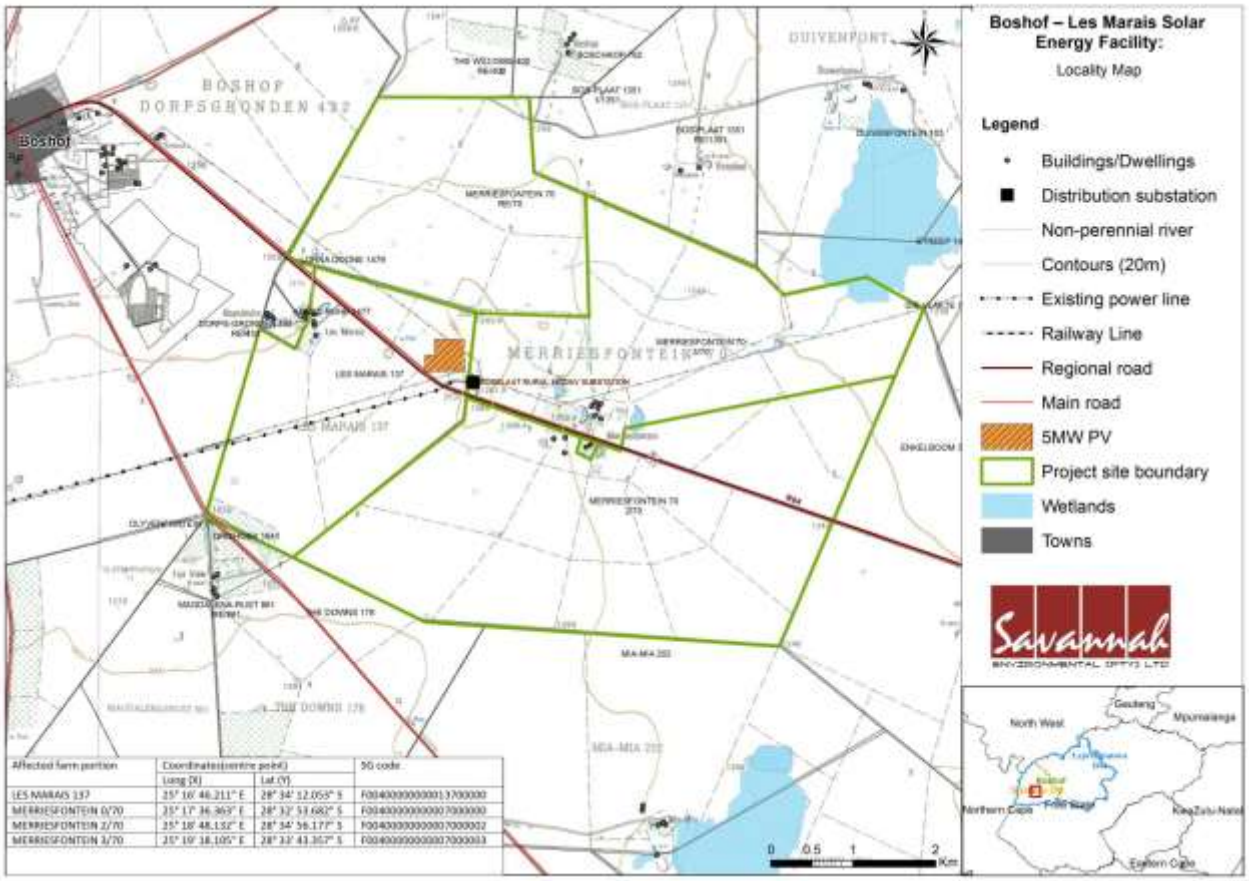

Figure 1: Map showing the location of the study site (green polygon) for the proposed Boshof - Les Marais / Buitenfontein Solar Energy Facility, Farm Les Marais 137, Lejeweleputswa District Municipality, Free State (Image kindly provided by Heritage Contracts and Archaeological Consulting CC).

2. GEOLOGICAL BACKGROUND

The Boshof - Les Marais / Buitenfontein Solar Energy Facility study area is situated in flat-lying terrain at *c*. 1240-1280 m amsl, either side of the R64 road to Bloemfontein and *c*. 5 km southeast of Boshof, Free State (Fig. 1). The land is primarily agricultural. Satellite images show that there is little or no bedrock exposure on site, with the possible exceptions of low dolerite exposures in the west and shallow pans in the east.

The geology of the study area near Boshof is shown on 1: 250 000 geological map 2824 Kimberley (Council for Geoscience, Pretoria), for which a short sheet explanation has been published by Bosch (1993) (Fig. 2). The western portion of the area, including the proposed solar facility development site, is underlain by dolerite intrusions of Early Jurassic age assigned to the Karoo Dolerite Suite (Jd, pink in Fig. 2). These igneous rocks are entirely unfossiliferous. The eastern portion of the study area is underlain by basinal mudrocks of the Tierberg Formation (Ecca Group) of Permian age (Pt, buff in Fig. 2).

The **Tierberg Formation** (**Pt**) (Ecca Group, Karoo Supergroup) is a recessive-weathering, mudrock-dominated succession consisting predominantly of dark, well-laminated, carbonaceous shales with subordinate thin, fine-grained sandstones (Visser *et al.* 1977, Prinsloo 1989, Zawada 1992, Bosch 1993, Le Roux 1993, Viljoen 2005, Johnson *et al*., 2006). The Tierberg shales are Early to Middle Permian in age and were deposited in a range of offshore, quiet water environments below wave base. These include basin plain, distal turbidite fan and distal prodelta settings in ascending order (Viljoen 2005, Almond 2008a). Thin coarsening-upwards cycles occur towards the top of the formation with local evidence of soft-sediment deformation, ripples and common calcareous concretions (often with well-

developed cone-in-cone structures). A restricted, brackish water environment is reconstructed for the Ecca Basin at this time. Close to the contact with Karoo dolerite intrusions the Tierberg mudrocks are baked to a dark grey hornfels with a reddish-brown crust or patina (Prinsloo 1989).

Small but mappable exposures of **calcrete** or **surface limestone** (Qc, yellow in Fig. 2) occur overlying sediments of the Ecca Group as well as the Karoo Dolerite Suite intrusions - the probable source of much of the carbonate – in the southern part of the study area, and are probably associated with pan sediments overlying the Tierberg outcrop in the eastern part of the area. These pedogenic limestone deposits replace or displace the near-surface bedrocks to a depth of several meters. They reflect seasonally arid climates in the region over the last five or so million years and are briefly described for the Kimberley sheet area by Bosch (1993). Although calcrete is still forming in the study area today, it forms subsurface and when exposed at the surface is "almost definitely fossil" (Botha 1988). Key review papers on South African calcretes are those by Netterberg (1978, 1980 among other papers). Calcrete types commonly encountered include glaebular calcrete (with discrete nodules), honeycomb calcrete (with coalescent glaebules) and hardpan calcrete (solid limestone within at most minor voids). The surface limestones may reach thicknesses of over 10 m, but are often much thinner, and are locally conglomeratic with clasts of reworked calcrete as well as exotic pebbles.

3. PALAEONTOLOGICAL HERITAGE

The fossil record of the **Tierberg Formation** has been reviewed in detail by Almond (2008a). Rare body fossil records include disarticulated microvertebrates (*e.g.* fish teeth and scales) from calcareous concretions in the Koffiefontein sheet area (Zawada 1992) and allochthonous plant remains (drifted leaves, petrified wood). The latter become more abundant in the upper, more proximal (prodeltaic) facies of the Tierberg (*e.g.* Wickens 1984). Prinsloo (1989) records numerous plant impressions and unspecified "fragmentary vertebrate fossils" (possibly temnospondyl amphibians) within fine-grained sandstones in the Britstown sheet area. Dark carbonaceous Ecca mudrocks are likely to contain palynomorphs (*e.g.* pollens, spores, acritarchs). Bosch (1993) and Visser *et al.* (1977) briefly mention body fossils within the Tierberg mudrocks in the broader Kimberley region. Concretions within the lower part of the formation at Kaffirs Kop 193 (southeast of Belmont) and on Klippiespan 205 contain fish scales, coprolites and sponge spicules. Records of abundant silicified wood within the upper Tierberg succession near De Aar are better referred to the Waterford Formation (*cf* Almond 2012, 2013).

The commonest fossils by far in the Tierberg Formation are sparse to locally concentrated assemblages of trace fossils that are often found in association with thin event beds (*e.g.* distal turbidites, prodeltaic sandstones) within more heterolithic successions. A modest range of ten or so different ichnogenera have been recorded from the Tierberg Formation (*e.g.* Abel 1935, Anderson 1974, 1976, Wickens 1980, 1984, 1994, 1996, Prinsloo 1989, De Beer *et al*., 2002, Viljoen 2005, Almond 2008a). These are mainly bedding parallel, epichnial and hypichnial traces, some preserved as undertracks. Penetrative, steep to subvertical burrows are rare, perhaps because the bottom sediments immediately beneath the sediment / water interface were anoxic. Most Tierberg ichnoassemblages display a low diversity and low to moderate density of traces. Apart from simple back-filled and / or lined horizontal burrows (*Planolites, Palaeophycus*) they include arthropod trackways (*Umfolozia*) and associated resting impressions (*Gluckstadtella*), undulose fish swimming trails (*Undichna*) that may have been generated by bottom-feeding palaeoniscoids, horizontal epichnial furrows (so-called *Scolicia*) often attributed to gastropods (these are also common in the co-eval Collingham Formation; Viljoen 1992, 1994), arcuate, finely-striated feeding excavations of an unknown arthropod (*Vadoscavichnia*), beaded traces ("*Hormosiroidea*" or "*Neonereites*"), small sinusoidal surface traces (*Cochlichnus*), small star-shaped feeding burrows (*Stelloglyphus*) and zigzag horizontal burrows (*Beloraphe*), as well as possible narrow (<1cm) *Cruziana* scratch burrows. The symmetrical, four-pronged trace *Broomichnium* (= *Quadrispinichna* of Anderson, 1974 and later authors) often occurs in groups of identical size (*c*. 3.5cm wide) and similar orientation on the bedding plane. This trace has frequently been misinterpreted as a web-footed tetrapod or

arthropod trackway (*e.g.* Van Dijk *et al*. 2002 and references therein). However, Braddy and Briggs (2002) present a convincing case that this is actually a current-orientated arthropod resting trace (cubichnion), probably made by small crustaceans that lived in schools of similar-sized individuals and orientated themselves on the seabed with respect to prevailing bottom currents. Distinctive broad (3-4 cm), strap-shaped, horizontal burrows with blunt ends and a more-or-less pronounced transverse ribbing occur widely within the Tierberg mudrocks. They have been described as "fucoid structures" by earlier workers (*e.g.* Ryan 1967) by analogy with seaweeds, and erroneously assigned to the ichnogenera *Plagiogmus* by Anderson (1974) and *Lophoctenium* by Wickens (1980, 1984). Examples up to one metre long were found in Tierberg mudrocks near Calvinia in 1803 by H. Lichtenstein, who described them as "eel fish". These are among the first historical records of fossils in South Africa (MacRae 1999). These as yet unnamed burrows are infilled with organized arrays of faecal pellets (Werner 2006). Sandstone sole surfaces with casts of complex networks of anastomosing (branching and fusing) tubular burrows have been attributed to the ichnogenus *Paleodictyon* (Prinsloo 1989) but may more appropriately assigned to *Megagrapton* (Almond 1998). These so-called graphoglyptid burrows are associated with turbidite facies from the Ordovician to Recent times and have been interpreted as gardening burrows or *agrichnia* (Seilacher, 2007). Microbial mat textures, such as *Kinneyia*, also occur in these offshore mudrocks but, like the delicate grazing traces with which they are often associated, are generally under-recorded.

Late Caenozoic **calcretes** may contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings such as pans; Partridge & Scott 2000) may be expected occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient, Plio-Pleistocene alluvial gravels.

The **Karoo Dolerite suite** comprises intrusive igneous rocks that do not contain fossils (Duncan & Marsh 2006).

The broader Boshof - Les Marais / Buitenfontein Solar Energy Facility study area near Boshof is generally of MEDIUM to LOW palaeontological sensitivity. However, the proposed development footprint lies within the Karoo dolerite outcrop area that is of VERY LOW palaeontological sensitivity.

4. CONCLUSIONS & RECOMMENDATIONS

Large portions of the broader study area of the proposed Boshof - Les Marais / Buitenfontein Solar Energy Facility near Boshof, Free State, are underlain by Permian basinal mudrocks of the Tierberg Formation (Ecca Group) and Late Caenozoic calcretes and pan sediments, all of which are of MEDIUM to LOW palaeontological sensitivity. However, the proposed solar facility development site is underlain by Early Jurassic intrusive igneous rocks of the Karoo Dolerite Suite that are entirely unfossiliferous. The impact significance of the proposed solar project development on local fossil heritage resources, given its small footprint and underlying geology, is considered to be LOW.

It is therefore recommended that, pending the discovery of substantial new fossil remains during construction, exemption from further specialist palaeontological studies is granted for the proposed Boshof - Les Marais / Buitenfontein Solar Energy Facility.

Any substantial fossil remains (*e.g.* plant remains, vertebrate bones, teeth) encountered during excavation should be reported to SAHRA (Contact details: Ms. Colette Scheermeyer, South African Heritage Resources Agency, 111 Harrington Street. P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za. Fax: +27 (0)21 462 4509. Web:www.sahra.org.za) for possible mitigation by a professional palaeontologist at the developers expense.

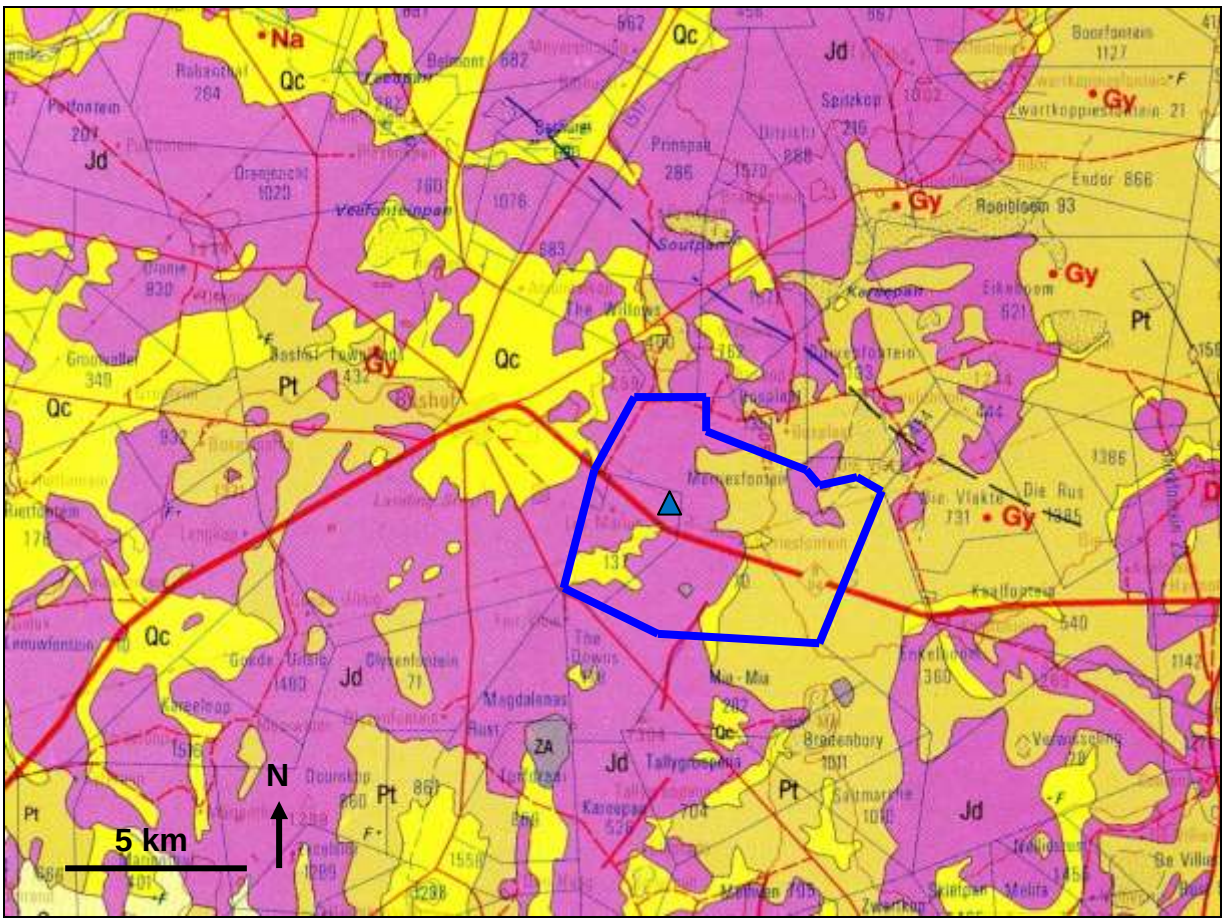

Fig. 2. Extract from 1: 250 000 geology map 2824 Kimberley (Council for Geoscience, Pretoria) showing the outline of the study area for the proposed Boshof - Les Marais / Buitenfontein Solar Energy Facility near Boshof, Free State (blue polygon). The study area is underlain by Permian basinal mudrocks of the Tierberg Formation (Ecca Group; Pt, buff), Early Jurassic Karoo dolerite intrusions (Jd, pink) and Late Caenozoic calcretes (Qc, yellow). The proposed solar facility site (blue triangle) overlies the dolerite outcrop area.

5. KEY REFERENCES

ABEL, O. 1935. Vorzeitliche Lebenspuren. xv+ 644 pp. Gustav Fischer, Jena.

ALMOND, J.E. 1998. Non-marine trace fossils from the western outcrop area of the Permian Ecca Group, southern Africa. Tercera Reunión Argentina de Icnologia, Mar del Plata, 1998, Abstracts p. 3.

ALMOND, J.E. 2008a. Fossil record of the Loeriesfontein sheet area (1: 250 000 geological sheet 3018). Unpublished report for the Council for Geoscience, Pretoria, 32 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2008b. Palaeozoic fossil record of the Clanwilliam sheet area (1: 250 000 geological sheet 3218). Unpublished report for the Council for Geoscience, Pretoria, 49 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2010. Eskom Gamma-Omega 765kV transmission line: Phase 2 palaeontological impact assessment. Sector 1, Tanqua Karoo to Omega Substation (Western and Northern Cape Provinces), 95 pp + appendix. Natura Viva cc, Cape Town.

ALMOND, J.E. 2010b. Proposed photovoltaic power generation facility at De Aar, Northern Cape Province. Palaeontological impact assessment: desktop study, 17 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2012. Two wind energy facilities on the Eastern Plateau near De Aar, Northern Cape Province, proposed by Mulilo Renewable Energy (Pty) Ltd. Palaeontological specialist study: combined desktop and field-based assessments, 55 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2013. Proposed 16 Mtpa expansion of Transnet's existing manganese ore export railway line & associated infrastructure between Hotazel and the Port of Ngqura, Northern & Eastern Cape. Part 3: Kimberley to De Aar, Northern Cape. Palaeontological specialist assessment: combined field-based and desktop study, 65 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. & PETHER, J. 2008. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.

ANDERSON, A.M. 1974. Arthropod trackways and other trace fossils from the Early Permian lower Karoo Beds of South Africa. Unpublished PhD thesis, University of Witwatersrand, Johannesburg, 172 pp.

ANDERSON, A.M. 1975. Turbidites and arthropod trackways in the Dwyka glacial deposits (Early Permian) of southern Africa. Transactions of the Geological Society of South Africa 78: 265-273.

ANDERSON, A.M. 1976. Fish trails from the Early Permian of South Africa. Palaeontology 19: 397-409, pl. 54.

ANDERSON, A.M. 1981. The *Umfolozia* arthropod trackways in the Permian Dwyka and Ecca Groups of South Africa. Journal of Paleontology 55: 84-108, pls. 1-4.

ANDERSON, A.M. & MCLACHLAN, I.R. 1976. The plant record in the Dwyka and Ecca Series (Permian) of the south-western half of the Great Karoo Basin, South Africa. Palaeontologia africana 19: 31-42.

ANDERSON, J.M. & ANDERSON, H.M. 1985. Palaeoflora of southern Africa. Prodromus of South African megafloras, Devonian to Lower Cretaceous, 423 pp. Botanical Research Institute, Pretoria & Balkema, Rotterdam.

BAMFORD, M. 1999. Permo-Triassic fossil woods from the South African Karoo Basin. Palaeontologia africana 35, 25-40.

BAMFORD, M.K. 2004. Diversity of woody vegetation of Gondwanan southern Africa. Gondwana Research 7, 153-164.

BOSCH, P.J.A. 1993. Die geologie van die gebied Kimberley. Explanation to 1: 250 000 geology Sheet 2824 Kimberley, 60 pp. Council for Geoscience, Pretoria.

BOTHA, G.A. 1988. The sedimentology and stratigraphy of Cainozoic sediments in the area northwest of Thabazimbi. Geological Survey of South Africa, Bulletin 91.

BRADDY, S.J. & BRIGGS, D.E.G. 2002. New Lower Permian nonmarine arthropod trace fossils from New Mexico and South Africa. Journal of Paleontology 76: 546-557.

BUATOIS, L. & MANGANO, M.G. 2004. Animal-substrate interactions in freshwater environments: applications of ichnology in facies and sequence stratigraphic analysis of fluvio-lacustrine successions. In: McIlroy, D. (Ed.) The application of ichnology to

palaeoenvironmental and stratigraphic analysis. Geological Society, London, Special Publications 228, pp 311-333.

BUATOIS, L.A. & MÁNGANO, M.G. 2007. Invertebrate ichnology of continental freshwater environments. In: Miller, W. III (Ed.) Trace fossils: concepts, problems, prospects, pp. 285-323. Elsevier, Amsterdam.

DE BEER, C.H., GRESSE, P.G., THERON, J.N. & ALMOND, J.E. 2002. The geology of the Calvinia area. Explanation to 1: 250 000 geology Sheet 3118 Calvinia. 92 pp. Council for Geoscience, Pretoria.

DINGLE, R.V., SIESSER, W.G. & NEWTON, A.R. 1983. Mesozoic and Tertiary geology of southern Africa. viii + 375 pp. Balkema, Rotterdam.

DU TOIT, A. 1954. The geology of South Africa. xii + 611pp, 41 pls. Oliver & Boyd, Edinburgh.

DUNCAN, A.R. & MARSH, J.S. 2006. The Karoo Igneous Province. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 501-520. Geological Society of South Africa, Marshalltown.

JOHNSON, M.R., VAN VUUREN, C.J., VISSER, J.N.J., COLE, D.I., De V. WICKENS, H., CHRISTIE, A.D.M., ROBERTS, D.L. & BRANDL, G. 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 461-499. Geological Society of South Africa, Marshalltown.

LE ROUX, F.G. 1993. Die geologie van die gebied Colesberg. Explanation to 1: 250 000 geology Sheet 3024, 12 pp. Council for Geoscience, Pretoria.

LE ROUX, F.G. & KEYSER, A.W. 1988. Die geologie van die gebied Victoria-Wes. Explanation to 1: 250 000 geology Sheet 3122, 31 pp. Council for Geoscience, Pretoria.

MACRAE, C. 1999. Life etched in stone. Fossils of South Africa, 305 pp. The Geological Society of South Africa, Johannesburg.

NETTERBERG, F. 1969a. Ages of calcretes in southern Africa. South African Archaeological Bulletin 24, 88-92.

NETTERBERG, F. 1969b. Interpretation of some basic calcrete types. South African Archaeological Bulletin 24, 117-122.

NETTERBERG, F. 1978. Dating and correlation of calcretes and other pedocretes. Transactions of the Geological Society of South Africa 81, 379-391.

NETTERBERG, F. 1980. Geology of South African calcretes: 1. Terminology, description, macrofeatures, and classification. Transactions of the Geological Society of South Africa 83, 255-283.

NETTERBERG, F. 1985. Pedocretes in Engineering geology of southern Africa 4: Post-Gondwana deposits (Ed. Brink, A.B.A.), 286-307.

PARTRIDGE, T.C. & SCOTT, L. 2000. Lakes and pans. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp.145-161. Oxford University Press, Oxford.

PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Geological Society of South Africa, Marshalltown.

PRINSLOO, M.C. 1989. Die geologie van die gebied Britstown. Explanation to 1: 250 000 geology Sheet 3022 Britstown, 40 pp. Council for Geoscience, Pretoria.

RYAN, P.J. 1967. Stratigraphic and palaeocurrent analysis of the Ecca Series and lowermost Beaufort Beds in the Karoo Basin of South Africa. Unpublished PhD thesis, University of the Witwatersrand, Johannesburg, 210 pp.

SEILACHER, A. 2007. Trace fossil analysis, xiii + 226pp. Springer Verlag, Berlin.

SIEBRITS, L.B. 1989. Die geologie van die gebied Sakrivier. Explanation of 1: 250 000 geology sheet 3020, 19 pp. Council for Geoscience, Pretoria.

SMITH, A.M. & ZAWADA, P.K. 1988. The Ecca-Beaufort transition zone near Philipstown, Cape Province: a marine shelf sequence. South African Journal of Geology 91, 75-82.

VAN DIJK, D.E., CHANNING, A. & VAN DEN HEEVER, J.A. 2002. Permian trace fossils attributed to tetrapods (Tierberg Formation, Karoo Basin, South Africa). Palaeontologia africana 38: 49-56.

VILJOEN, J.H.A. 2005. Tierberg Formation. SA Committee for Stratigraphy, Catalogue of South African Lithostratigraphic Units 8: 37-40.

VISSER, D.J.L*. et al*. 1989. The geology of the Republics of South Africa, Transkei, Bophuthatswana, Venda and Ciskei and the Kingdoms of Lesotho and Swaziland. Explanation of the 1: 1 000 000 geological map, fourth edition, 491 pp. Council for Geoscience, Pretoria.

VISSER, J.N.J. & LOOCK, J.C. 1974. The nature of the Ecca-Beaufort transition in the western and central Orange Free State. Transactions of the Geological Society of South Africa 77, 371-372.

VISSER, J.N.J., LOOCK, J.C., VAN DER MERWE, J., JOUBERT, C.W., POTGIETER, C.D., MCLAREN, C.H., POTGIETER, G.J.A., VAN DER WESTHUIZEN, W.A., NEL, L. & LEMER, W.M. 1977-78. The Dwyka Formation and Ecca Group, Karoo Sequence, in the northern Karoo Basin, Kimberley-Britstown area. Annals of the Geological Survey of South Africa 12, 143-176.

WERNER, M. 2006. The stratigraphy, sedimentology and age of the Late Palaeozoic *Mesosaurus* Inland Sea, SW-Gondwana: new implications from studies on sediments and altered pyroclastic layers of the Dwyka and Ecca Group (lower Karoo Supergroup) in southern Namibia. Dr rer. nat. thesis, University of Würzburg, 428 pp, 167 figs, 1 table.

WICKENS, H. DE V. 1980. Verslag oor kartering in die Calvinia gebied. Unpublished report, Council for Geoscience, Pretoria, 19 pp.

WICKENS, H. DE V. 1984. Die stratigraphie en sedimentologie van die Group Ecca wes van Sutherland. Unpublished MSc thesis, University of Port Elizabeth, viii + 86 pp.

WICKENS, H. DE V. 1992. Submarine fans of the Permian Ecca Group in the SW Karoo Basin, their origin and reflection on the tectonic evolution of the basin and its source areas. In: De Wit, M.J. & Ransome, I.G.D. (Eds.) Inversion tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of southern Africa, pp. 117-126. Balkema, Rotterdam.

WICKENS, H. DE V. 1994. Submarine fans of the Ecca Group. Unpublished PhD thesis, University of Port Elizabeth. 350 pp.

WICKENS, H. DE V. 1996. Die stratigraphie en sedimentologie van die Ecca Groep wes van Sutherland. Council for Geosciences, Pretoria Bulletin 107, 49pp.

ZAWADA, P.K. 1992. The geology of the Koffiefontein area. Explanation of 1: 250 000 geology sheet 2924, 30 pp. Council for Geoscience, Pretoria.

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 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.

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