

PALAEONTOLOGICAL SPECIALIST STUDY: PROPOSED EXEMPTION FROM FURTHER SPECIALIST STUDIES

**Proposed Venter Boerdery Middeldrift Breeder Facility on a portion of Portions 6, 10
and 40 of Farm T'Zoetgeneugd 192 near Addo, Sundays River Valley Municipality,
Eastern Cape**

John E. Almond PhD (Cantab.)
Natura Viva cc, PO Box 12410 Mill Street,
Cape Town 8010, RSA
naturaviva@universe.co.za

May 2018

EXECUTIVE SUMMARY

The Boeram Venter Trust is proposing to construct a poultry breeder house facility and associated infrastructure on a portion of Portions 6, 10 and 40 of Farm T'Zoetgeneugd 192, situated on the eastern side of the Sundays River, some 9km southwest of Addo, in the Sundays River Valley Municipality, Eastern Cape. The study area is underlain at depth by Early Cretaceous marine sediments of the Sundays River Formation (Uitenhage Group). Several important Cretaceous fossil localities, including marine invertebrates and rare dinosaur remains, have been recorded from the Sundays River beds along the Sundays River nearby (McLachlan and Anderson 1976). However, in the low-lying floodplain areas that are earmarked for the breeder facility and related agricultural developments, the Cretaceous bedrock is entirely mantled by Holocene river sediments of the Kudus Kloof Formation which may be up to several meters thick and are, at most, very sparsely fossiliferous. Given the small footprint of the proposed development, significant impacts on fossil heritage are therefore not anticipated here.

It is concluded that no further palaeontological heritage studies or specialist mitigation are required for this agricultural project, *pending* the discovery or exposure of any substantial fossil remains (e.g. vertebrate bones and teeth, shelly invertebrates, large blocks of petrified wood, fossil plant-rich horizons) during the construction phase.

The ECO responsible for these developments should be alerted to the possibility of important fossil remains being found either on the surface or exposed by fresh excavations during construction. Should fossil remains be discovered during construction, these should be safeguarded (preferably *in situ*) and the ECO should alert the Eastern Cape Provincial Heritage Resources Authority (ECPHRA. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; Email: smokhanya@ecphra.org.za) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist. A Chance Fossil Finds protocol is appended to this report.

1. INTRODUCTION & BRIEF

The Boeram Venter Trust is proposing to construct a poultry breeder house facility on a portion of Portions 6, 10 and 40 of Farm T'Zoetgeneugd 192, situated on the eastern side of the Sundays River, some 9km southwest of Addo, in the Sundays River Valley Municipality, Eastern Cape (Figures 1 & 2). The site is currently zoned Agriculture 1 and the area proposed for construction is taken up by cultivated fields / pastures, while the farm is being operated as a dairy farm. The farm portions measure ~196ha in combined extent and the total development footprint, including associated infrastructure, is anticipated to be no more than ~24ha. The portions of the farm not proposed for development and currently planted as lucerne will in future be replaced with citrus orchards. Existing infrastructure associated with the dairy farm (buildings and sheds) will be converted for use in support of the citrus orchards and no additional services infrastructure is required. However, new irrigation pipes will probably have to be installed to provide drip/ micro irrigation to the citrus orchards. The existing gravel access road on the eastern boundary of Portion 6 will be used to access the services infrastructure for the citrus orchards, however, this will be required to be widened in order to provide access to trucks during the operational phase.

The construction phase of the project will entail the clearing and levelling of the cultivated fields for the establishment of the six (6) breeder houses and associated infrastructure. The breeder facility will comprise the following main infrastructure components (Figure 3):

- 6 x breeder houses, measuring 120m x 16m each (1 920m² each), excluding concrete slabs for feed silo's and manure collection at the end of each house, as well as 6 x egg collection rooms and associated infrastructure. Three staff houses;
- An upgraded access point is proposed on the south boundary of the site and internal road network for delivery and collection of chicks, feed, and collection of fertilised eggs as well as manure. The width and condition of the existing access roads and road network to the site requires input from a Traffic specialist. Bulk Services, including the expansion of an existing storage dam, with a current capacity of 19 600m³, located on portions of Portion 6 and 10, installation of water reticulation system for the breeder facilities, as well as for domestic consumption and associated water treatment facility, installation of domestic foul sewer system, installation of stormwater management infrastructure and an internal road network varying in widths from 6 meters to 8 meters, widened at corners to accommodate truck turning paths (~30 meters).
 - The demolition of an existing dam, with a current capacity of 16 450m³ (10 140m²), located on Portion 6.

Public Process Consultants (Contact details: Sandy Wren, Public Process Consultants, 120 Diaz Road, Adcockvale, Port Elizabeth. Phone: 041 374 8426. Fax: 041 373 2002. E-mail: sandy@publicprocess.co.za) has been appointed by the applicant as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment for the proposed poultry breeder facility.

The study area is underlain at depth by potentially fossiliferous sediments of the Sundays River Formation (Uitenhage Group) of Early Cretaceous age, as well as by Quaternary or younger alluvium. In accordance with the National Heritage Resources Act, 1999, a palaeontological heritage assessment is required as part of a Heritage Impact Assessment for this project, since important fossil material (e.g. marine shells, dinosaur remains) has previously been recorded from the Kirkwood – Addo area within the Sundays River formation. In view of the very limited exposure of Cretaceous bedrocks within the study area, a basic desktop assessment of the fossil heritage resources in the study region was commissioned by Public Process Consultants

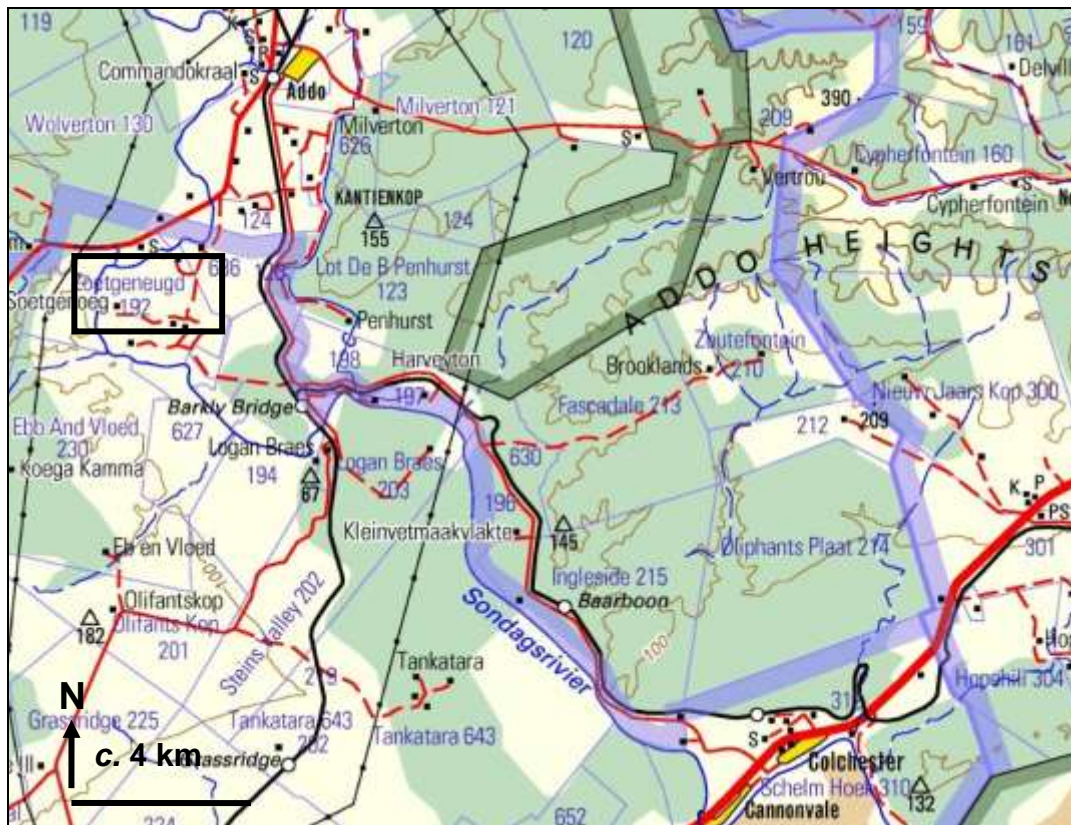


Figure 1: Extract from 1: 250 000 topographical sheet 3324 Port Elizabeth (Courtesy of the Chief Directorate Surveys and Mapping, Mowbray) showing the approximate location of the Middeldrift Poultry Breeder Facility study area on a portion of Portions 6, 10 and 40 of Farm T'Zoetgeneugd 192, situated within a bend of the Sundays River near Addo, Sundays River Valley Municipality, Eastern Cape (black rectangle).

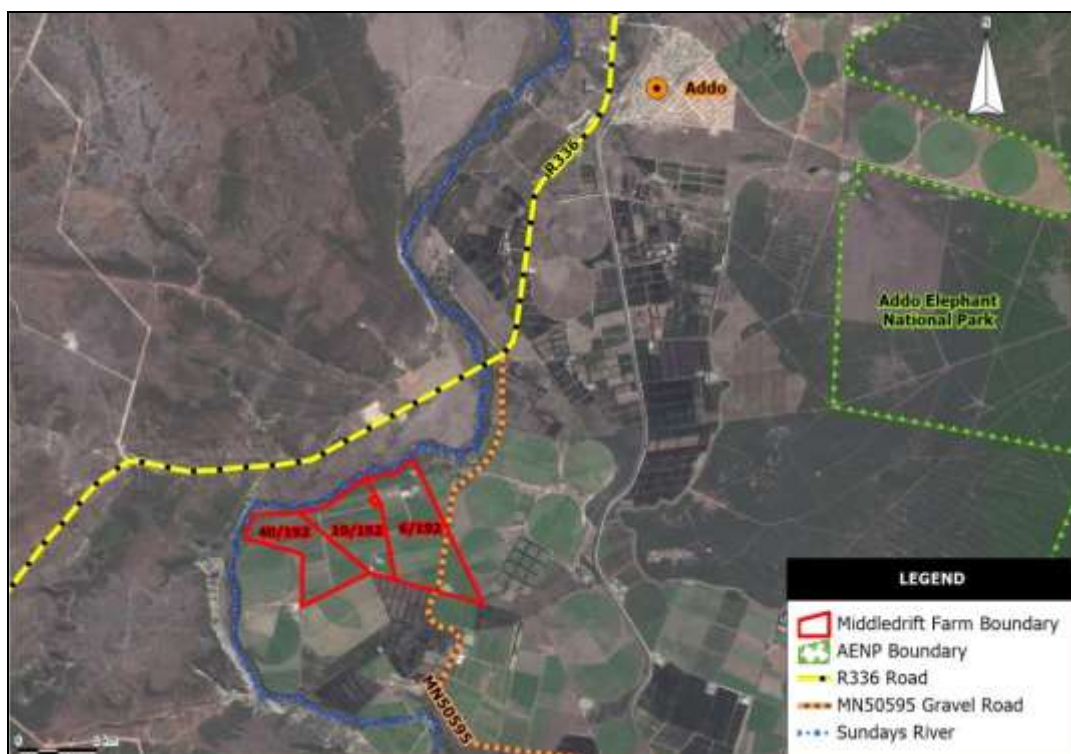


Figure 2: Google Earth© satellite image showing the location of the Middeldrift Chicken Breeder Facility study area (red polygons) on the inside of a bend in the Sundays River near Addo (Image supplied by Public Process Consultants).



Figure 3: Google Earth© satellite image showing the location of the Middledrift Chicken Breeder Facility (blue) within cultivated lands adjoining the Sundays River. Gravel road (orange line), enlarged dam (yellow line) and embankment (brown line). Scale bar = 800 m. N towards top of image.

2. GEOLOGICAL CONTEXT

The present study area on a portion of Portions 6, 10 and 40 is situated on gently sloping agricultural lands at ~ 25 – 30m amsl on the inside of a meander or bend, of the Sundays River, near Addo (Figures 1 to 3). The geology of the Addo area is shown on 1: 250 000 geological map 3324 Port Elizabeth (Council for Geoscience, Pretoria; Toerien & Hill 1989) (Figure 4). The Addo region lies within the extensive Algoa Basin that is infilled with a 3.5km - thick succession of alluvial fan, fluvial and estuarine to marine shelf sediments of Late Jurassic to Early Cretaceous age (~ 150-125Ma) that are referred to the **Uitenhage Group** (McLachlan & Anderson 1976, Shone 2006).

The study area is underlain at depth by Early Cretaceous marine sediments of the **Sundays River Formation** (Ks, red in Figure 4) (McLachlan & McMillan 1976, Tankard *et al.* 1982, Dingle *et al.*, 1983 and Shone 2006). Excellent cliff sections through the Sundays River Formation are seen on the western banks of the Sundays River, over 1km west of the breeder facility footprint (Figure 3). However, these recessive-weathering beds are not exposed within the study area itself. The bedrocks here are mantled by a thick succession of Late Caenozoic (probably mainly Holocene) **alluvium** (yellow with “flying bird” symbol in Figure 4) and soil, as expected in an inside-meander setting. Detailed geological mapping of Plio-Pleistocene terrace gravels along the Sundays River by Hattingh (2001) shows that no ancient alluvial deposits are mapped in the present study area (Figure 5). These younger alluvial deposits are mainly composed of unconsolidated, flat-bedded alluvial sand and silt with subordinate coarse sand and gravel horizons showing limited pedogenic modification (Hattingh 1994, 2001, Partridge *et al.* 2006).

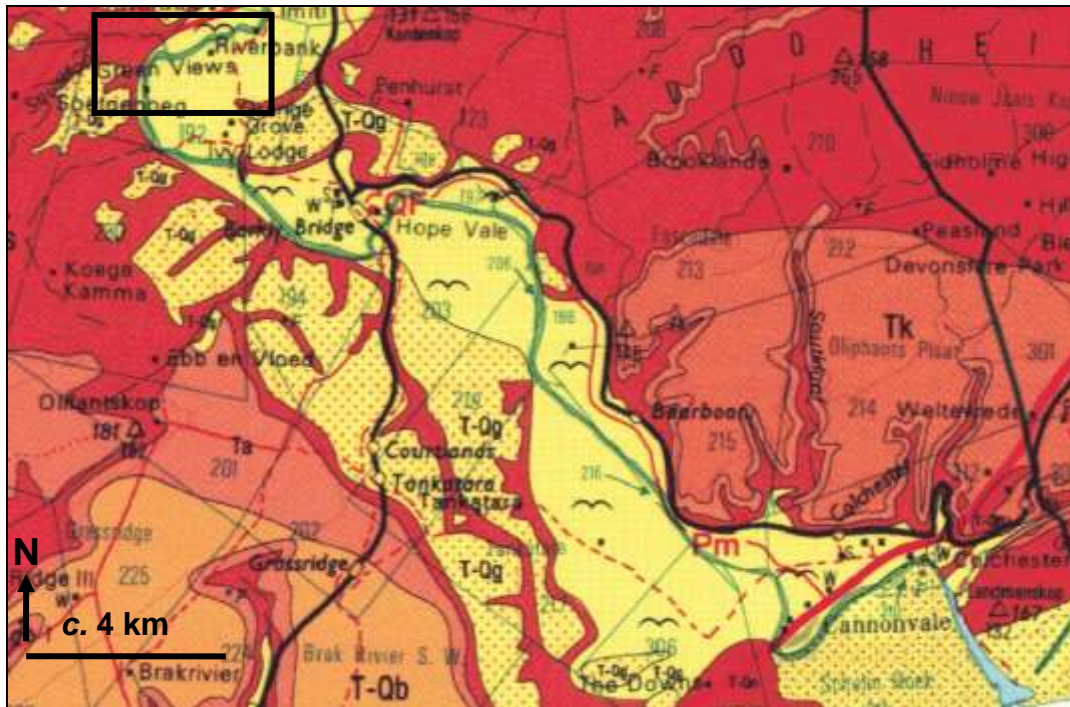


Figure 4: Extract from 1: 250 000 geological map 3324 Port Elizabeth (Council for Geoscience, Pretoria). The Middeldrift Chicken Breeder Facility study area on Farm T'Zoetgeneugd 192 some 9km SW of Addo, Eastern Cape (black rectangle), lies within a bend or meander of the Sundays River. It is underlain at depth by Early Cretaceous sediments of the Sundays River Formation (Ks, red) that are entirely mantled here by Holocene alluvium (yellow with flying bird symbol).

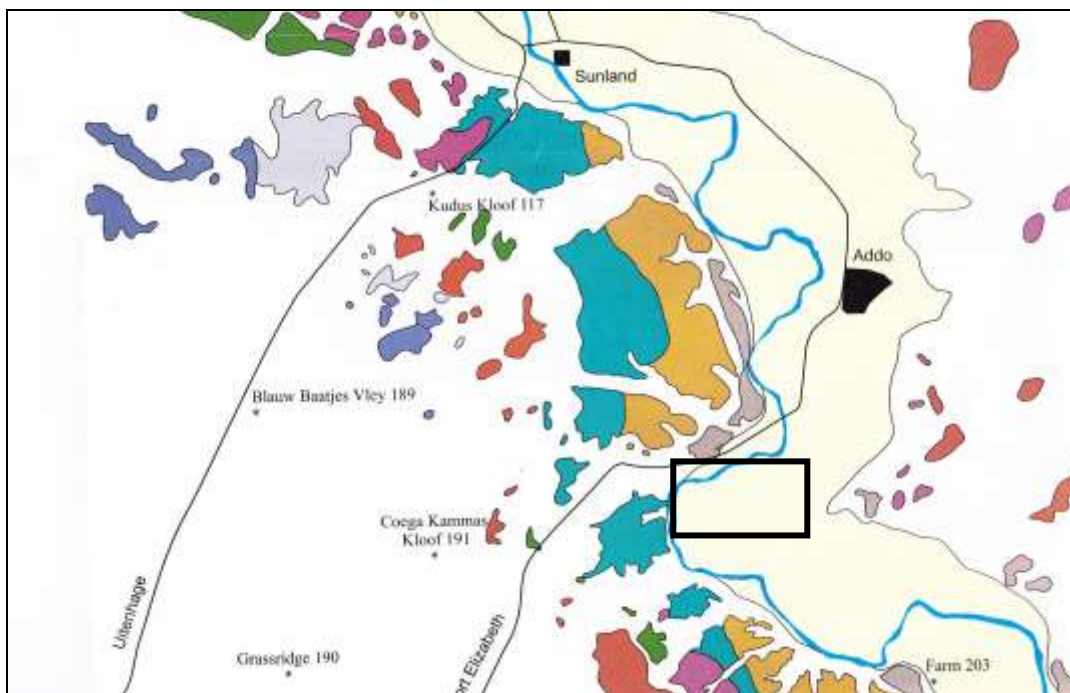


Figure 5: Extract from map of High-Level Terrace Gravels of the Sundays River published by Hattingh (2001, Appendix 2) showing the absence of older, Plio-Pleistocene deposits of the Kudus Kloof Formation within the present study area (black rectangle).

3. PALAEOLOGICAL HERITAGE

The Sundays River Formation (Uitenhage Group) contains one of the most prolific and scientifically important marine biotas of Mesozoic age in southern Africa (See brief reviews by MacRae 1999, Almond 2010). A sizeable number of important fossil marine invertebrate sites are located along the riverine cliffs fronting Zoetgeneugd (Figure 6). However, these Early Cretaceous bedrocks are unlikely to be substantially impacted by the proposed small-scale agricultural development which will probably only entail excavations into thick, geologically-young alluvial deposits and soils while the underlying bedrocks, in addition, may well be highly weathered.

Quaternary to Recent alluvial gravel, sand and clay deposits may contain sparse fossil remains of various types. In coarser sediments like river conglomerates these tend to be robust, highly disarticulated and abraded (e.g. rolled bones, teeth and horn cores of mammals and other vertebrates). Well-preserved skeletal remains of plants (e.g. wood, roots) and invertebrate animals (e.g. freshwater molluscs and crustaceans) as well as various trace fossils may also be found within fine-grained alluvium. Embedded human artefacts such as stone tools that can be assigned to a specific interval of the archaeological time scale (e.g. Middle Stone Age) can be of value for constraining the age of Pleistocene to Recent drift deposits like alluvial terraces.

It is concluded that the palaeontological sensitivity of the study area on Farm T'Zoetgeneugd 192 is LOW.

4. CONCLUSIONS & RECOMMENDATIONS

The poultry breeder facility study area on a portion of Portions 6, 10 and 40 of the Farm T'Zoetgeneugd 192, ~9km SW of Addo in the Sundays River Valley, Eastern Cape, is underlain at depth by Early Cretaceous marine sediments of the Sundays River Formation (Uitenhage Group). This succession has yielded rich fossil assemblages of marine invertebrates (notably molluscs, such as ammonites and bivalves), plant remains (e.g. driftwood), as well as very rare vertebrate remains (e.g. dinosaurs) from the Algoa Basin of the Eastern Cape. Several important Cretaceous fossil localities – including marine invertebrates and rare dinosaur remains - have been recorded along the Sundays River nearby (McLachlan and Anderson 1976).

However, in the low-lying areas that are earmarked for the poultry breeder facility and associated infrastructure, as well as related agricultural developments, the Sundays River Formation is entirely mantled by Holocene river sediments of the Kudus Kloof Formation which may be up to several meters thick and are, at most, very sparsely fossiliferous. Given the small footprint of the proposed development (~24ha), significant impacts on fossil heritage are therefore not anticipated here.

It is concluded that no further palaeontological heritage studies or specialist mitigation are required for this agricultural project, *pending* the discovery or exposure of any substantial fossil remains (e.g. vertebrate bones and teeth, shelly invertebrates, large blocks of petrified wood, fossil plant-rich horizons) during the construction phase.

The ECO responsible for these developments should be alerted to the possibility of important fossil remains being found either on the surface or exposed by fresh excavations during construction. Should fossil remains be discovered during construction, these should be safeguarded (preferably *in situ*) and the ECO should alert the Eastern Cape Provincial Heritage Resources Authority (ECPHRA. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; Email: smokhanya@ecphra.org.zaso) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist. A Chance Fossil Finds protocol is appended to this report.

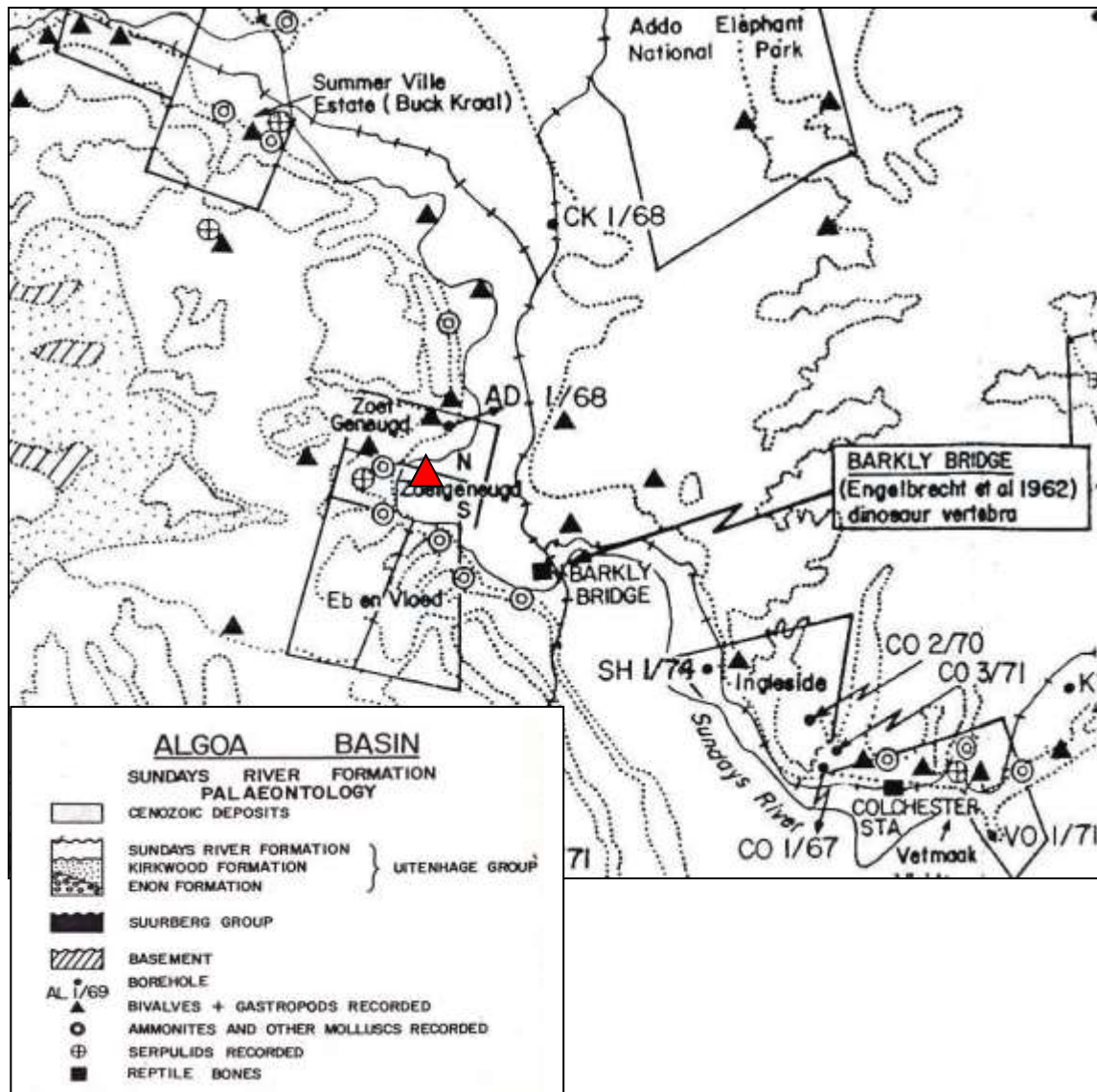


Figure 6: Fossil localities in the Sundays River Formation of the Algoa Basin in the Barkly Bridge – Zoetgeneugd sector of the Sundays River Valley near south of Addo (The Farm T’Zoetgeneugd 192 study area is marked by the red triangle). Several groups of marine invertebrates (crustaceans and molluscs, including bivalves, gastropods, belemnites and ammonites, as well as serpulid worm tubes) are reported from Sundays River Formation beds here, while dinosaur remains are recorded from Barkly Bridge itself (Figure modified from McLachlan & Anderson 1976, their Figure 8).

5. KEY REFERENCES

- ALMOND, J.E. 2010. Palaeontological heritage assessment of the Coega IDZ, Eastern Cape Province, 112 pp. plus appendix. Natura Viva cc, Cape Town.
- ALMOND, J.E. 2013. Expansion of agricultural activities on Portion 5 of the Farm Nooitgedacht No. 118, Sunland, near Addo, Sundays River Valley Municipality, Eastern Cape. palaeontological specialist study: desktop basic assessment, 17 PP. Natura Viva cc, Cape Town.
- ALMOND, J.E. 2014. Agricultural Development of Portion 16 & Portion 17 of the Farm 203 Logan Braes near Addo, Nelson Mandela Bay Municipality, Eastern Cape. Palaeontological specialist study: desktop basic assessment, 17 pp. Natura Viva cc, Cape Town.
- ALMOND, J.E., DE KLERK, W.J. & GESS, R. 2008. Palaeontological heritage of the Eastern Cape. Interim technical report for SAHRA, 25 pp.
- ANDERSON, J.M. & ANDERSON, H.M. 1985. Palaeoflora of southern Africa. Prodrum of South African megaflores, Devonian to Lower Cretaceous, 423 pp, 226 pls. Botanical Research Institute, Pretoria & Balkema, Rotterdam.

- BAMFORD, M.K. 1986. Aspects of the palaeoflora of the Kirkwood and Sundays River Formations, Algoa Basin, South Africa. Unpublished M.Sc. Thesis, Univ. Witwatersrand, 160pp.
- COOPER, M.R. 1981. Revision of the Late Valanginian Cephalopoda from the Sundays River Formation of South Africa, with special reference to the Genus *Olcostephanus*. *Annals of the South African Museum* 83: 147-366, 206 figs
- COOPER, M.R. 1991. Lower Cretaceous Trigonioidea (Mollusca, Bivalvia) from the Algoa Basin, with a revised classification of the order. *Annals of the South African Museum* 100:1-52.
- 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.L. 1954. The geology of South Africa (3rd edition). 611 pp, 41 pls, geological map insert.
- ENGELBRECHT, L.N.J., COERTZE, F.J. & SNYMAN, A.A. 1962. Die geologie van die gebied tussen Port Elizabeth en Alexandria, Kaapprovinsie. Explanation to geology sheet 3325 D Port Elizabeth, 3326 C Alexandria and 3425 B, 54pp., 8 pls. Geological Survey of South Africa / Council for Geosciences, Pretoria.
- HATTINGH, J. 1994. Kudus Kloof Formation. SA Committee for Stratigraphy, Catalogue of South African Lithostratigraphic Units 5, 35-36. Council for Geoscience, Pretoria.
- HATTINGH, J. 2001. Late Cenozoic drainage evolution in the Algoa Basin with special reference to the Sundays River Valley. Council for Geoscience, South Africa Bulletin 128, 141 pp, appendices.
- KITCHIN, F.L. 1908. The invertebrate fauna and palaeontological relationships of the Uitenhage Series. *Annals of the South African Museum* 7(2):21-250, pls. 2-11.
- LE ROUX, F.G. 2000. The geology of the Port Elizabeth – Uitenhage area. Explanation of 1: 50 000 geology Sheets 3325 DC and DD, 3425 BA Port Elizabeth, 3325 CD and 3425 AB Uitenhage, 3325 CB Uitenhage Noord and 3325 DA Addo, 55pp. Council for Geoscience, Pretoria.
- MACRAE, C. 1999. Life etched in stone. Fossils of South Africa. 305pp. The Geological Society of South Africa, Johannesburg.
- McLACHLAN, I.R. & McMILLAN, I.K. 1976. Review and stratigraphic significance of southern Cape Mesozoic palaeontology. *Transactions of the Geological Society of South Africa*. 79: 197-212.
- McMILLAN, I. K., 2003. The Foraminifera of the Late Valanginian to Hauterivian (Early Cretaceous) Sundays River Formation of the Algoa Basin, Eastern Cape Province, South Africa. *Annals of the South Africa Museum* 106:1-274, 84 figs, 4 tables.
- SAHRA 2013. Minimum standards: palaeontological component of heritage impact assessment reports, 15 pp. South African Heritage Resources Agency, Cape Town.
- SHONE, R.W. 1976. The sedimentology of the Mesozoic Algoa Basin. Unpublished MSc thesis, University of Port Elizabeth, 48 pp.
- SHONE, R.W. 2006. Onshore post-Karoo Mesozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) *The geology of South Africa*, pp. 541-552. Geological Society of South Africa, Marshalltown.
- TANKARD, A.J., JACKSON, M.P.A., ERIKSSON, K.A., HOBDAV, D.K., HUNTER, D.R. & MINTER, W.E.L. 1982. Crustal evolution of southern Africa – 3.8 billion years of Earth history, xv + 523 pp., pls. Springer Verlag, New York.
- TOERIEN, D.K. & HILL, R.S. 1989. The geology of the Port Elizabeth area. Explanation to 1: 250 000 geology Sheet 3324 Port Elizabeth, 35 pp. Council for Geoscience. Pretoria.
- WINTER, H. DE LA R. 1973. Geology of the Algoa Basin, South Africa. In: Blant, G. (Ed.) *Sedimentary basins of the African coast. Part, 2 South and East Coast*, pp. 17-48. Association of African Geological Surveys, Paris.

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, Mpumalanga, KwaZulu-Natal 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.



Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

CHANCE FOSSIL FINDS PROCEDURE: Middledrift Breeder Facility on Portions 6, 10 & 40 of Farm T'Zoetgeneugd 192 near Addo

Province & region:	EASTERN CAPE, Sundays River Valley Municipality	
Responsible Heritage Resources Authority	ECPHRA (Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; Email: smokhanya@ecphra.org.za)	
Rock unit(s)	Late Caenozoic alluvium including sands and gravels	
Potential fossils	Vertebrate bones, teeth and horn cores, mollusc and crustacean remains or plant material such as subfossil wood	
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 Authority 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 Authority 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 Authority and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Authority, 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 Authority	
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 Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.	