

SAHRA Case ID: 11179

Prospecting Right Application NC 30/5/1/1/2/11750 PR

**UPDATED PALAEOLOGICAL ASSESSMENT
WITH REVISED FOSSIL FINDS PROCEDURE FOR THE EMP.
PROPOSED PROSPECTING ON A PORTION OF PORTION 1 OF THE FARM
VOORUITZIGT 81, SOL PLAATJE MUNICIPALITY, KIMBERLEY MAGISTERIAL
DISTRICT, NORTHERN CAPE PROVINCE**

BY

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FOR

Archaeological and Heritage Services Africa (Pty) Ltd

CLIENT/APPLICANT

MYSTIC PEARL 157 (PTY) LTD

10 JANUARY 2018

DECLARATION OF INDEPENDENCE

UPDATED PALAEOLOGICAL ASSESSMENT

WITH REVISED FOSSIL FINDS PROCEDURE FOR THE EMP.

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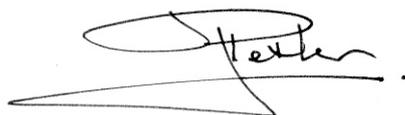
Terms of Reference

This assessment forms part of the Heritage Assessment it assesses the overall palaeontological (fossil) sensitivities of formations underlying the Project Area.

Declaration

I ...**John Pether**....., as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in the compilation of the above report;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have any vested interest in the proposed activity proceeding;
- have disclosed to the EAP any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management act;
- have provided the EAP with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.



Signature of the specialist

Date: 10 JANUARY 2018

CURRICULUM VITAE

John Pether, M.Sc., Pr. Sci. Nat. (Earth Sci.)

Independent Consultant/Researcher recognized as an authority with 35 years' experience in the field of coastal-plain and continental-shelf palaeoenvironments, fossils and stratigraphy, mainly involving the West Coast/Shelf of southern Africa. Has been previously employed in academia (South African Museum) and industry (Trans Hex, De Beers Marine).

At present an important involvement is in Palaeontological Impact Assessments (PIAs) and mitigation projects in terms of the National Heritage Resources Act 25 (1999) (~240 PIA reports to date) and is an accredited member of the Association of Professional Heritage Practitioners (APHP). Continues to be involved as consultant to offshore and onshore marine diamond exploration ventures. Expertise includes:

- Coastal plain and shelf stratigraphy (interpretation of open-pit exposures, on/offshore cores and exploration drilling).
- Sedimentology and palaeoenvironmental interpretation of shallow marine, aeolian and other terrestrial surficial deposits.
- Marine macrofossil taxonomy (molluscs, barnacles, brachiopods) and biostratigraphy.
- Marine macrofossil taphonomy.
- Sedimentological and palaeontological field techniques in open-cast mines (including finding and excavation of vertebrate fossils (bones)).

Membership of Professional Bodies

- South African Council of Natural Scientific Professions. Earth Science. Reg. No. 400094/95.
- Geological Society of South Africa.
- Palaeontological Society of Southern Africa.
- Southern African Society for Quaternary Research.
- Accredited member, Association of Professional Heritage Practitioners, Western Cape.

Past Clients Palaeontological Assessments

Agency for Cultural Resource Management (ACRM).	Klomp Group.
AMATHEMBA Environmental.	Megan Anderson, Landscape Architect.
Anél Bignon Environmental Consultants.	Ninham Shand (Pty) Ltd.
Arcus Gibb (Pty) Ltd.	PD Naidoo & Associates (Pty) Ltd.
Aurecon SA (Pty) Ltd.	Perception Environmental Planning.
BKS (Pty) Ltd. Engineering and Management.	PHS Consulting.
Bridgette O'Donoghue Heritage Consultant.	Resource Management Services.
Cape Archaeology, Dr Mary Patrick.	Robin Ellis, Heritage Impact Assessor.
Cape EAPrac (Cape Environmental Assessment Practitioners).	Savannah Environmental (Pty) Ltd.
CCA Environmental (Pty) Ltd.	Sharples Environmental Services cc
Centre for Heritage & Archaeological Resource Management.	Site Plan Consulting (Pty) Ltd.
Chand Environmental Consultants.	Strategic Environmental Focus (Pty) Ltd.
CK Rumboll & Partners.	SRK Consulting (South Africa) (Pty) Ltd.
CNdV Africa	UCT Archaeology Contracts Office (ACO).
CSIR - Environmental Management Services.	UCT Environmental Evaluation Unit
Digby Wells & Associates (Pty) Ltd.	Urban Dynamics.
Enviro Logic	Van Zyl Environmental Consultants
Environmental Resources Management SA (ERM).	ENVIRO DINAMIK.
Greenmined Environmental	Wethu Investment Group Ltd.
Guillaume Nel Environmental Management Consultants.	Withers Environmental Consultants.

Stratigraphic consulting including palaeontology

Afri-Can Marine Minerals Corp	Council for Geoscience
De Beers Marine (SA) Pty Ltd.	De Beers Namaqualand Mines.
Geological Survey Namibia	IZIKO South African Museum.
Namakwa Sands (Pty) Ltd	NAMDEB

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1 BACKGROUND

The applicant, Mystic Pearl 157 (Pty) Ltd., proposes to prospect for diamonds on a Portion of Portion 1 of the farm Vooruitzigt 81 in the Kimberley Magisterial District of the Northern Cape Province. Wadala Mining and Consultants (Pty) Ltd were engaged and have submitted the Basic Assessment Report (BAR) and the Environmental Management Plan (EMP) on behalf of the applicant. A Heritage Impact Assessment has been submitted to the South African Heritage Resources Agency (SAHRA) by Archaeological and Heritage Services Africa (Pty) Ltd. (AHSa), which included a desktop Palaeontological Assessment. An Interim Comment has been issued by SAHRA (Case ID 11179) in which the Fossil Finds Procedure (FFP) accompanying the Palaeontological Assessment is regarded as too generic and not adequately addressing the conditions specific to the geological formations and fossils that will be affected by the development.

The purpose of this brief report is to address this issue by providing a summary of the main aspects of the geology and fossil potential and to provide an updated, more appropriate FFP for inclusion in updated EMP guidelines with respect to palaeontological finds.

2 LOCATION

The Prospecting Application area is a Portion of Portion 1 of the farm Vooruitzigt 81 (Figure 1), on the western outskirts of Kimberley just northeast of the intersection of the roads N8/R64 and R31.

1:50 000 Topo-cadastral Sheet 2824DA Barkley West.

Project Area approx: Southeast vertex: --28.740747°S / 24.706865°E. Northwest vertex: --28.722572°S / 24.670157°E. WGS84.

3 LOCALITY PLAN

See Figure 1.

4 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The earth works proposed in the prospecting programme involves 50 bulk sample trenches, 25 by 15 m in extent and 0.5 to ~7 m deep, located in groups of five in ten rectangular zones (Figure 1). A typical section of the deposits is expected to be ~3 m of sand and calcrete overburden underlain by 2-4 m of gravel. Material will be hauled to a diamond plant to be situated in the already-disturbed south-eastern part of the area. Excavation of a “slimes” dam for washed-out sand and mud will be required.

5 HERITAGE RESOURCES IDENTIFIED

The Project Area is situated high on the edge of the Vaal River drainage at ~1200 m asl., on the gentle northern slope of the Bultfontein salient (Figure 1), otherwise known as Carter’s Ridge, the site of Anglo-Boer War engagements during the 1899/1900 Boer siege of Kimberley. The local bedrock comprises sedimentary rocks of the lower part of **Karoo Supergroup**, viz. the **Dwyka Group** glacial tillite deposits and the **Prince Albert Formation** shales (**Ecca Group**), and the extensive sheets of igneous dolerite which later intruded molten into these deposits. Within the Vaal River Valley to the northwest, the ice-scoured basal palaeosurface beneath the eroded-away 300 Ma Dwyka glacial deposits is exposed on “glacial pavements” formed on the very ancient 2700 Ma lavas of the Allanridge Formation, Ventersdorp Supergroup (Ma = million years ago). Outcrops of the Allanridge Formation (Figure 2, Ra) to the northwest of the Project Area indicate the removal of Karoo strata from the exhumed, ~300 Ma basal Karoo landscape.

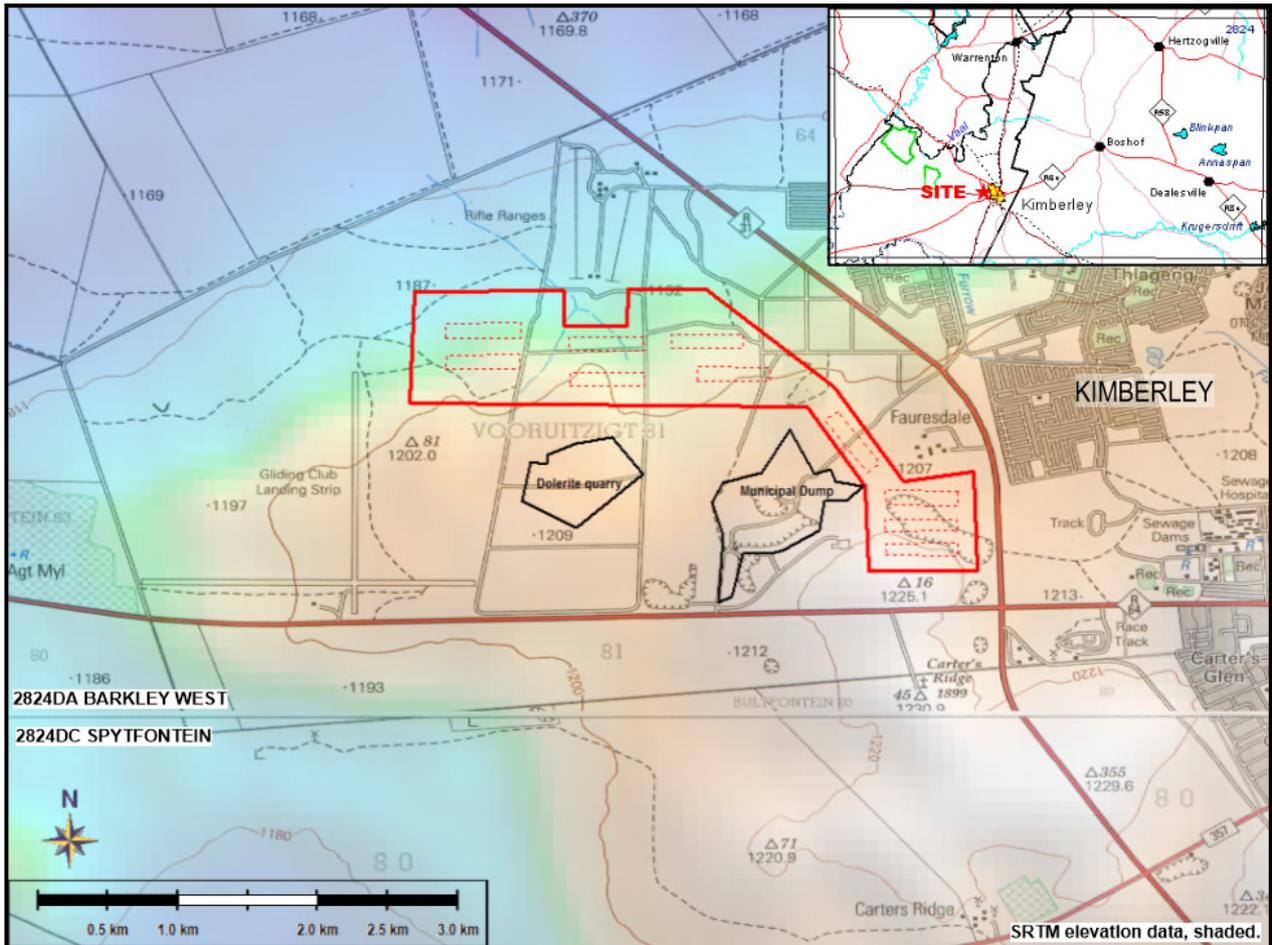


Figure 1. Location of the Project Area. Rectangles outlined by dashes are zones for bulk-sampling trenches.

The Dwyka tillites are relatively thin in the Kimberley area and are succeeded by the dark shales (mudrocks) of the Prince Albert Formation (Figure 2, Ppr) deposited under marine conditions after melting of the Dwyka ice sheets. By ~183 Ma these deposits were buried at depth in the subsided Karoo Basin where they were intruded by steep dolerite dykes feeding the eruptions of the Drakensberg basalt lavas and horizontal dolerite sills (Jd) which were squeezed in between the beds of the Ecca Group, mainly in the Upper Prince Albert Formation in this area. About 100 million years later (90-80 Ma) kimberlitic volcanoes carrying diamonds were erupted.

The Kimberley dolerite sill, now exposed by erosion of ~2 km of Karoo Supergroup deposits, is the major bedrock formation of the area, typically forming the higher ground (Figure 2, Jd). The upper parts of the kimberlite pipes were also eroded away and their diamond content was distributed into the alluvial gravels of local drainages. Some of these gravel alluvial deposits are preserved as residua in the landscape and are the target of the prospecting. Calcrete (Figure 2, Qc) has formed in the soil profiles developed in the weathered dolerite and in the residual gravels. A mantle of red, Kalahari-type sand and incipient soils covers slopes and lower-lying parts of the area (Figure 2, Qs). The calcrete and Kalahari sands may be correlated very broadly with the **Mokalanen** and **Gordonia** formations of the **Kalahari Group**, respectively (late Pliocene - Quaternary).

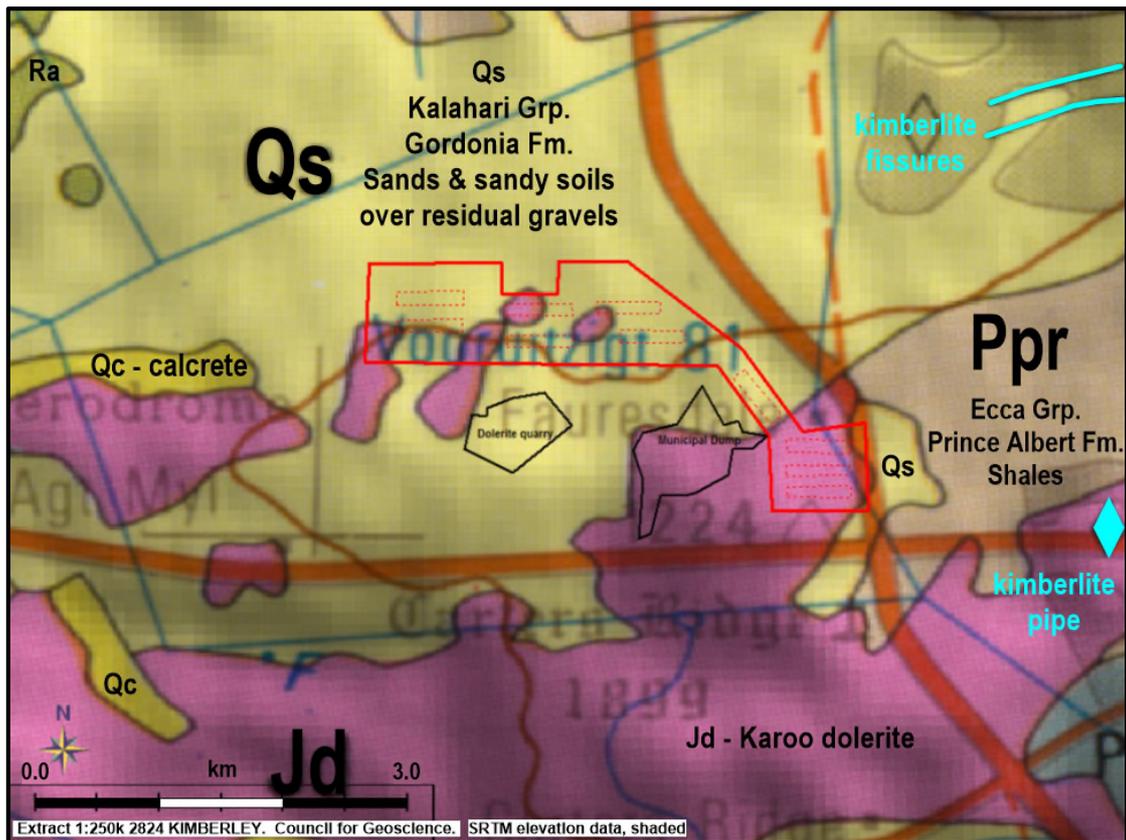


Figure 2. Surface geology of the Project Area.

6 ANTICIPATED IMPACTS ON PALAEOONTOLOGICAL HERITAGE RESOURCES

The Project Area is mainly underlain by unfossiliferous bedrock of Karoo dolerite. It is possible that, in places, the dolerite has been eroded away and the underlying baked shales of the Prince Albert Formation are exposed. This may be the case in the south-eastern part of the project area where these bedrock shales are exposed nearby (Figure 2). As the prospecting excavations will terminate on the shale bedrock no significant impact on its fossil content is likely.

The residual alluvial gravels in the Project Area are deemed equivalent to the oldest, highest terrace gravels of the Vaal River, *viz.* the Nooitgedacht and Droogeveldt deposits (De Wit, 2004). These derived “Rooikoppie” gravels have been subjected to a long history of weathering and pedogenesis and have evidently not yielded fossil finds. A notable exception are calcified fluvial gravels in palaeochannels in the vicinity of Mahura Muthla near Kuruman, on the high northern Vaal watershed formed by the Ghaap Plateau, where an array of fossil petrified woods occur as rounded pebbles and log pieces. The wood anatomies identified are representative of at least four periods *viz.* Upper Karoo (post-Permian), Early Cretaceous, Late Cretaceous and Tertiary (De Wit *et al.*, 2009), attesting to the remarkable persistence of this remnant of an ancient land surface. The gravels in the Project Area may also contain petrified wood, but the palaeontological sensitivity is LOW as most of the gravels are no longer in a primary context.

The red Kalahari sands overburden (Gordonia Fm.) may also include trace fossils such as root casts and insect burrows, particularly termite burrows and termitaria. Land snails (*Dorcasia*, *Xeroceratus*), tortoise carapaces and ostrich eggshell are typical. Larger burrows

in compact sands are made by lizards, ground squirrels, meerkats, moles and aardvarks. These may contain fossil material and the large aardvark burrows may sequester hyaena bone accumulations. However, such finds of larger-mammal fossil bones are rare in the Gordonia Formation dunes and coversands and consequently the overall palaeontological sensitivity of the Gordonia Formation is LOW (Almond & Pether, 2009).

7 RECOMMENDATIONS

In summary, there is some possibility that petrified fossil material, most likely wood, could occur in the residual, derived gravels. Such finds will be of considerable scientific significance. The overlying Kalahari sands may contain buried archaeological material, associated fossil bones, or bone accumulations in burrows.

It is recommended that a requirement to be alert for possible fossil materials and buried archaeological material be included in the Environmental Management Plan (EMP) for the proposed prospecting operations.

7.1 FOSSIL FINDS PROCEDURE

As part of pre-prospecting Environmental and Health & Safety awareness training, personnel must be instructed to be alert for the occurrence of fossil wood, bones, archaeological material and of unrecorded burials.

If a potential petrified fossil wood or bone pebble/cobble is noticed in the alluvial gravels, it must be retrieved from loss immediately and placed in the safekeeping of the Environmental Control Officer (ECO) who must then inform SAHRA, providing information as below.

In the event of a possible find of bones or a buried concentration of archaeological material in the Kalahari Gordonia sands, work must cease at the site and the works foreman and the Environmental Control Officer (ECO) for the project must be informed immediately. Unearthed parts/fragments of the find must be retrieved and returned to the main find site which must be protected from further disturbance.

The ECO or representative must then inform SAHRA immediately and provide:

- A description of the nature of the find.
- Position of the excavation (GPS) and depth.
- Digital images of excavation showing vertical sections (sides) (with scales).
- Detailed images of the finds (with scale included).

SAHRA and an appropriate specialist palaeontologist will assess the information and liaise with the developer, the environmental consultants and the ECO and a suitable response will be established.

8 REFERENCES

Almond, J.E. & Pether, J. 2009. Palaeontological Heritage of the Northern Cape. SAHRA Palaeotechnical Report, Natura Viva cc., Cape Town. 121pp.

De Wit, M.C.J. 2004. The diamondiferous sediments on the farm Nooitgedacht (66), Kimberley, South Africa. South African Journal of Geology 107: 477-488.

De Wit, M.C.J., Ward, J.D., Bamford, M.K. & Roberts, M.J. 2009. The significance of the Cretaceous diamondiferous gravel deposit at Mahura Muthla, Northern Cape Province, South Africa. South African Journal of Geology 112: 89-108.

9 APPENDIX 1. PALAEOONTOLOGICAL SENSITIVITY RATING

Palaeontological Sensitivity refers to the likelihood of finding significant fossils within a geologic unit.

HIGH: Assigned to geological formations known to contain palaeontological resources that include rare, well-preserved fossil materials important to on-going palaeoclimatic, palaeobiological and/or evolutionary studies. Fossils of land-dwelling vertebrates are typically considered significant. Such formations have the potential to produce, or have produced, vertebrate remains that are the particular research focus of palaeontologists and can represent important educational resources as well.

MODERATE: Formations known to contain palaeontological localities and that have yielded fossils that are common elsewhere, and/or that are stratigraphically long-ranging, would be assigned a moderate rating. This evaluation can also be applied to strata that have an unproven, but strong potential to yield fossil remains based on its stratigraphy and/or geomorphologic setting.

LOW: Formations that are relatively recent or that represent a high-energy subaerial depositional environment where fossils are unlikely to be preserved, or are judged unlikely to produce unique fossil remains. A low abundance of invertebrate fossil remains can occur, but the palaeontological sensitivity would remain low due to their being relatively common and their lack of potential to serve as significant scientific resources. However, when fossils are found in these formations, they are often very significant additions to our geologic understanding of the area. Other examples include decalcified marine deposits that preserve casts of shells and marine trace fossils, and fossil soils with terrestrial trace fossils and plant remains (burrows and root fossils)

MARGINAL: Formations that are composed either of volcanoclastic or metasedimentary rocks, but that nevertheless have a limited probability for producing fossils from certain contexts at localized outcrops. Volcanoclastic rock can contain organisms that were fossilized by being covered by ash, dust, mud, or other debris from volcanoes. Sedimentary rocks that have been metamorphosed by the heat and pressure of deep burial are called metasedimentary. If the meta sedimentary rocks had fossils within them, they may have survived the metamorphism and still be identifiable. However, since the probability of this occurring is limited, these formations are considered marginally sensitive.

NO POTENTIAL: Assigned to geologic formations that are composed entirely of volcanic or plutonic igneous rock, such as basalt or granite, and therefore do not have any potential for producing fossil remains. These formations have no palaeontological resource potential.

Adapted from Society of Vertebrate Paleontology. 1995. Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources - Standard Guidelines. News Bulletin, Vol. 163, p. 22-27.