Palaeontological Impact Assessment for the proposed Prospecting Right application for the Farm Kannikwa 156 and Farm Kannikwa Vlakte 157 near Port Nolloth in Richtersveld Local Municipality, Northern Cape Province

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Desktop Study (Phase 1)

For

(AHSA) Archaeological and Heritage Services Africa (Pty) Ltd

Reg. No. 2016/281687/07

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Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf
Experience: 33 years research and lecturing in Palaeontology
25 years PIA studies and over 300 projects completed

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Archaeological and Heritage Services (Pty) Ltd, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A desktop Palaeontological Impact Assessment was requested for the Prospecting Right Application on the Farm Kannikwa 156 and Farm Kannikwa Vlakte 157 near Port Nolloth in Richtersveld Local Municipality, Northern Cape, Northern Cape Province.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies on the non-fossiliferous granites and gneisses of the Namaqualand area, indicated a having zero to insignificant palaeosensitivity on the SAHRIS map. The rest of the area is also indicated as having low (blue) palaeosensitivity and this applies to the fluvial sands and alluvium along the ephemeral watercourses and the Gordonia Formation sands. It is unlikely that any fossils would be found in the sands and alluvium because these are transported sediments but clasts of wood have been found on the nearby Farm Oubeep. Therefore, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor / environmental officer/ other designated responsible person once excavations/drilling/trenching activities have commenced. As far as the palaeontology is concerned, the project should be authorised.

Table of Contents

1. Background

Thunderflex 78 (Pty) Ltd is applying for Prospecting Rights on the Farm Kannikwa 156 and Farm Kannikwa Vlakte 157 near Port Nolloth in Richtersveld Local Municipality, Northern Cape (Figures 1-3).

The two farms are adjacent to each other with Kannikwa 156 just north of the R382 and Kannikwa Vlakte 156 just south of the road. The farms are about 8-10 km east of the coastal town of Port Nolloth.

A desktop Palaeontological Impact Assessment was requested for the project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

Figure 1: Google Earth map of the general area to show the relative land marks. The Kannikwa and Kannikwa Vlagte prospecting rights area project is shown by the RE 156 and RE 157 notation.

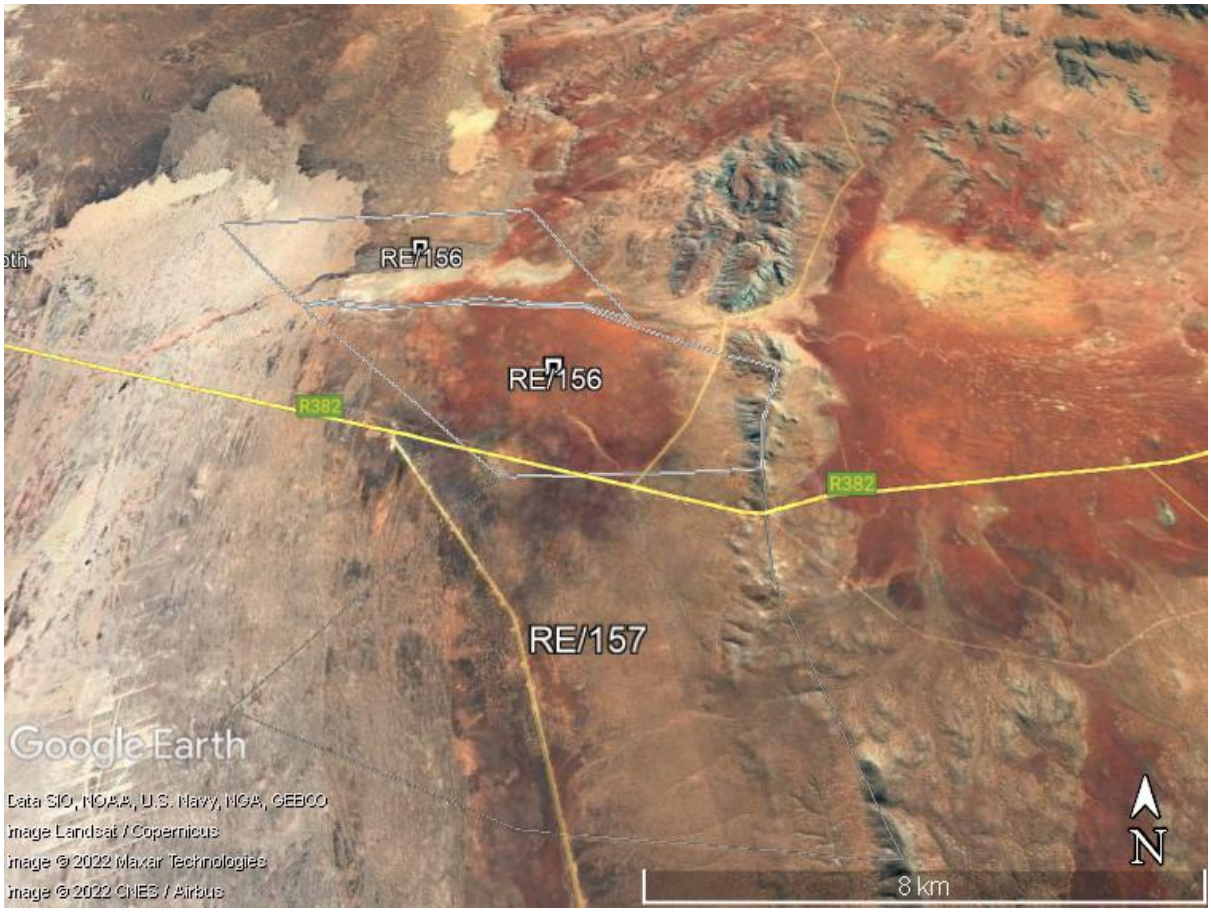

Figure 2: Google Earth Map of the proposed prospecting rights areas on Farms Kannikwa and Kannikwa Vlakte, east of Port Nolloth, with the boundaries shown by the very thin grey lines.

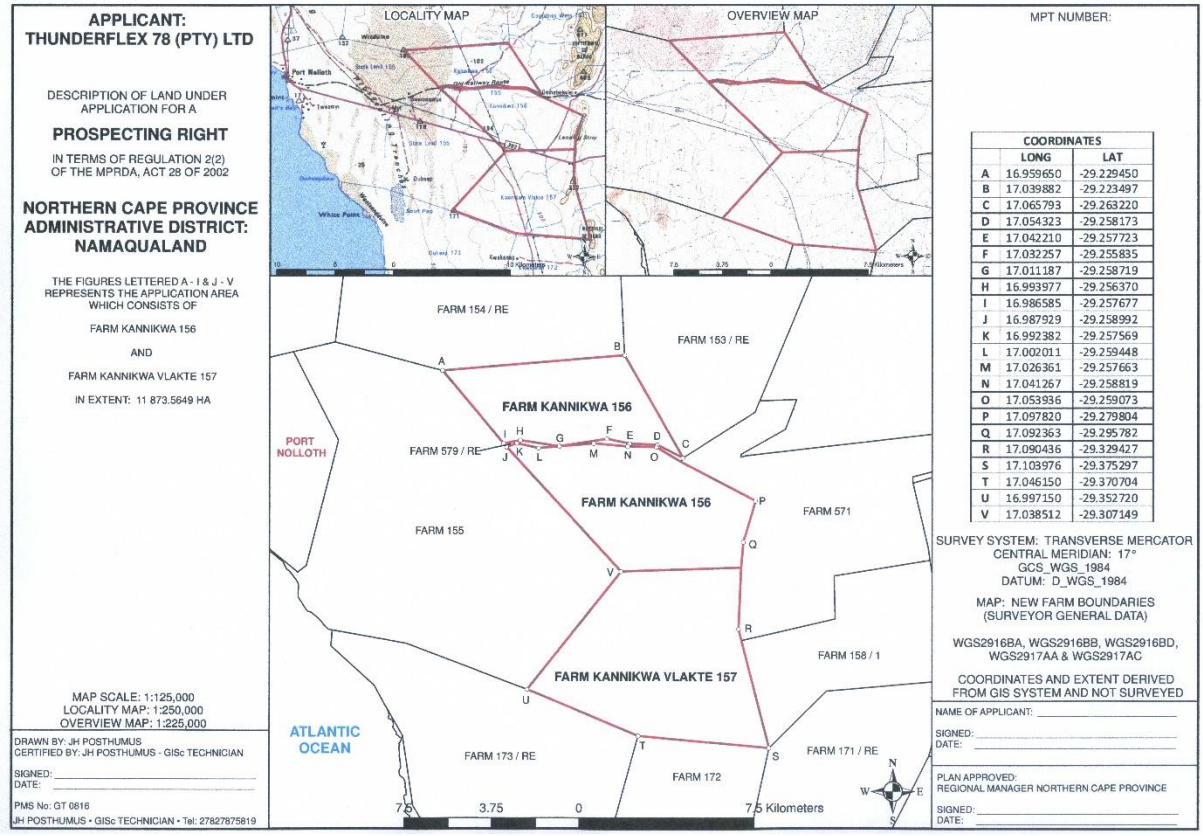

Figure 3: Regulation 2(2) map for the Kannikwa PR application process.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

The prospecting rights areas lie in the Namaqua-Natal Province in the Namaqua section (Figure 4, Table 2). The Namaqua-Natal Province is a tectono-stratigraphic province and forms the southern and western boundary of the ancient Kaapvaal Craton, and extends below the Karoo Basin sediments to the south (Cornell et al., 2006). It comprises rocks that were formed during the Namaqua Orogeny (mountain-building) some 1200 – 1000 million years ago. It has been divided by geologists into a number of terranes (similar lithology and bounded by shear zones). There are three main lithologic units used to separate the terranes as well as the shear zones but still there is some debate about the terranes (ibid). Very simply, the lithologic units are older reworked rocks, juvenile rocks formed during tectonic activities and metamorphosed, and intrusive granitoids.

According to Cornell et al. (2006) the five terranes are:
A - Richtersveld Subprovince (undifferentiated terranes)
B – Bushmanland Terrane (granites)
C – Kakamas Terrane (supracrustal metapelite ca 2000 Ma
D – Areachap Terrane (supracrustal rocks and granitoids)
E – Kaaien Terrane (Keisian aged metaquartzites and deformed volcanic rocks).

The project lies in the Bushmanland Terrane with its northern boundary against the Richtersveld Subprovince and the eastern boundary against the Kakamas Terrance (ibid). The Namaqua-Natal Province rocks are volcanic in origin and frequently metamorphosed. Several outcrops occur in the area and probably underlie the Gordonia sands.

Overlying many of these rocks are loose sands and sand dunes of the Gordonia Formation, Kalahari Group of Neogene Age. The Gordonia Formation is the youngest of six formations and is the most extensive, stretching from the northern Karoo, Botswana, Namibia to the Congo River (Partridge et al., 2006). It is considered to be the biggest palaeo-erg in the world (ibid). The sands have been derived from local sources with some additional material transported into the basin (Partridge et al., 2006). Much of the Gordonia Formation comprises linear dunes that were reworked a number of times before being stabilised by vegetation (ibid).

A narrow band of Neogene sediments along the West coast of southern Africa from Elands Bay in the south to Alexander Bay on the Orange River are informally (not SACS approved) called the West Coast Group as proposed by Roberts (1999). A number of rivers have incised through the underlying Gariep Supergroup metasediments and deeply weathered and kaolinised granitoids. Marine incursions and regressions during the Cretaceous and Tertiary have caused the repeated cutting and re-filling of these fluvial deposits and as a result their age and correlation is very complex. Such deposits are rich in diamonds so have been studied (de Wit et al., 2016).

The Neogene “West Coast Group” comprises the basal Alexander Bay Formation that extends along the length of the coast, the overlying southerly Curlew Formation.

Overlying but synchronous aeolian deposits form dunes of loose sands or cemented aeolianites. Three members comprise the Alexander Bay Formation and are distinguished by their height above the present sealevel (packages) and marine shell components. The lower Kleinsee Member (90m package) is very thin and composed of shelly, gravelly, sandy mud and *Isognomon* fossil shells (Roberts et al., 2006). The Avontuur Member (50m package) represents lower shoreface bands of coarse gravel, fine sand, sand and mud, with fossil burrows and shells of *Donax* spp. The upper Hondeklip Bay Member (30m package) represent the proximal lower shoreface to upper shoreface sands, gravels. These sands were deposited as trough crossbedding lanes, ripples and minor dunes and form the thickest layers in the Alexander Bay Formation. The component sequences of the Alexander Bay Formation are transgressed and truncated by younger, high energy beach deposits, the Curlew Strand Formation, and comprise calcified to unconsolidated sandy to gravelly deposits. These are up to 12m above sealevel and can contain marine shells similar to those along the coast today (Roberts et al., 2006).

Ages of these strata are uncertain but have been suggested to be middle Miocene for the Kleinsee Member, Mio-Pliocene for the Avontuur Member, Late Pliocene for the Hondeklip Member and Plio-Holocene for the Curlew Strand Formation (Roberts et al., 2006).

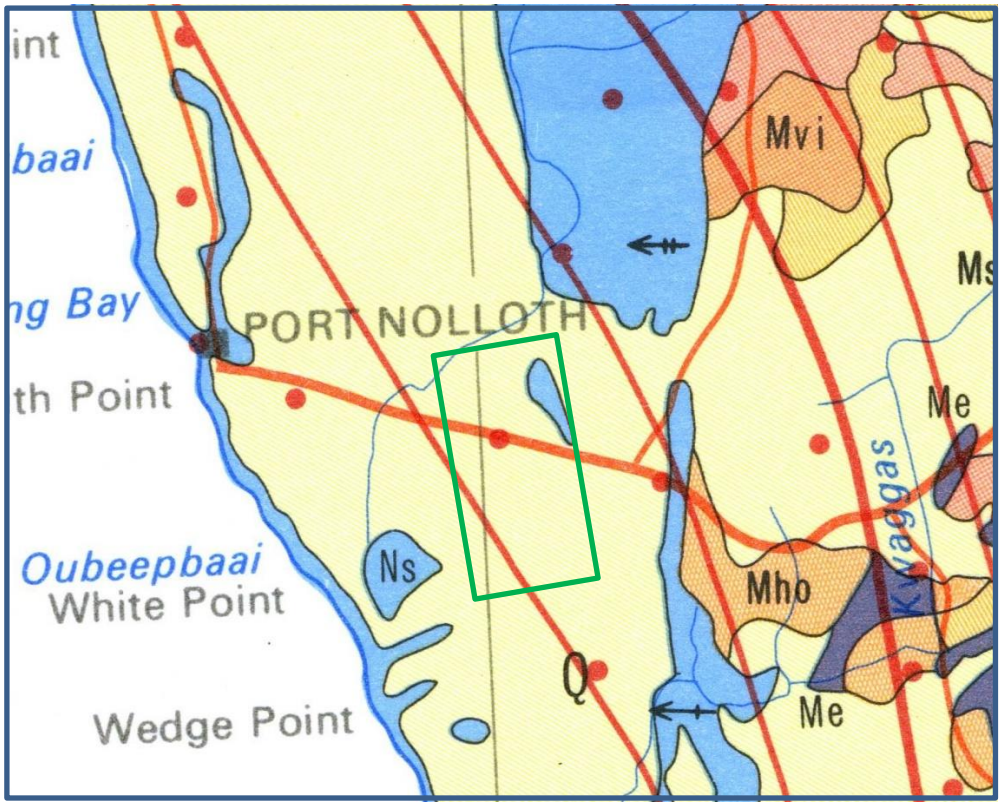

Figure 4: Geological map of the area east of Port Nolloth. The location of the proposed project is indicated within the green rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 1 000 000 map.

Table 2: Explanation of symbols for the geological map and approximate ages (Cornell et al., 2006; Roberts et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 1.2 – 1 Ma
Ns	Stinkfontein Fm, Gariep Complex	Quartzite, arkose, dolomite, diamictite, lava tuff	Neoproterozoic ca 1000 Ma
Msp	Spektakel Suite	Aplogranite, porphyritic granite	Neoproterozoic ca 1060 Ma
Mli	Little Namaqualand Suite	Augen gneiss	Neoproterozoic ca 1200 Ma
Mgl	Gladkop Suite	Grey fine-grained gneiss	Neoproterozoic
Mho	Hooghoor Suite	Pink gneiss	Neoproterozoic

ii. Palaeontological context

The SAHRIS palaeosensitivity map for Farms Kannikwa 156 and Kannikwa Vlakte 157 appears to be based on the 1: 1 000 000 geological map rather than the 1:250 000 and the West Coast Group strata are not distinguished from the Quaternary Kalahari Group sediments. The low resolution map provided by Roberts et al. (2006; Fig 1) shows that the West Coast Group sediments extend inland roughly 20 km at Port Nolloth so we can assume that Kannikwa which is about 8-10km inland will be within the West Coast Group zone. However, the lower lying areas will be filled with sands and alluvium from upstream, probably Gordonia Formation and younger transported sediments. Since it is not known exactly which sediments are in the Kannikwa prospecting area, a Fossil Chance Find Protocol should be added.

Along the coast, especially in the small river channels, on Farm Oubeep which is southwest of the prospecting area, there are deposits of Cretaceous fossil woods that have been washed down the palaeo-rivers with the alluvial diamonds (Bamford and Corbett, 1994, 1995). The silicified woods are large sub-rounded pebbles and cobbles with chatter marks but have distinct woody striations.

The palaeontological sensitivity of the area under consideration is presented in Figure 5. The site for prospecting is in the Quaternary sands and alluvium, possibly sourced from the Gordonia Formation. Since these sands have been transported they would not contain any fossils in primary context. They might have included fragments of more robust fossils such as bones or silicified woods from farther upstream. When and if the river flows the stones, bones and fragments would be tumbled and washed downstream so their occurrence would be very rare and unpredictable. The SAHRIS palaeosensitivity map indicates that the area is of zero sensitivity (Figure 5) but should be moderate because fossils can be transported from farther inland.

The older granites of the Little Namaqualand Suite are of volcanic origin and would not preserve any fossils.

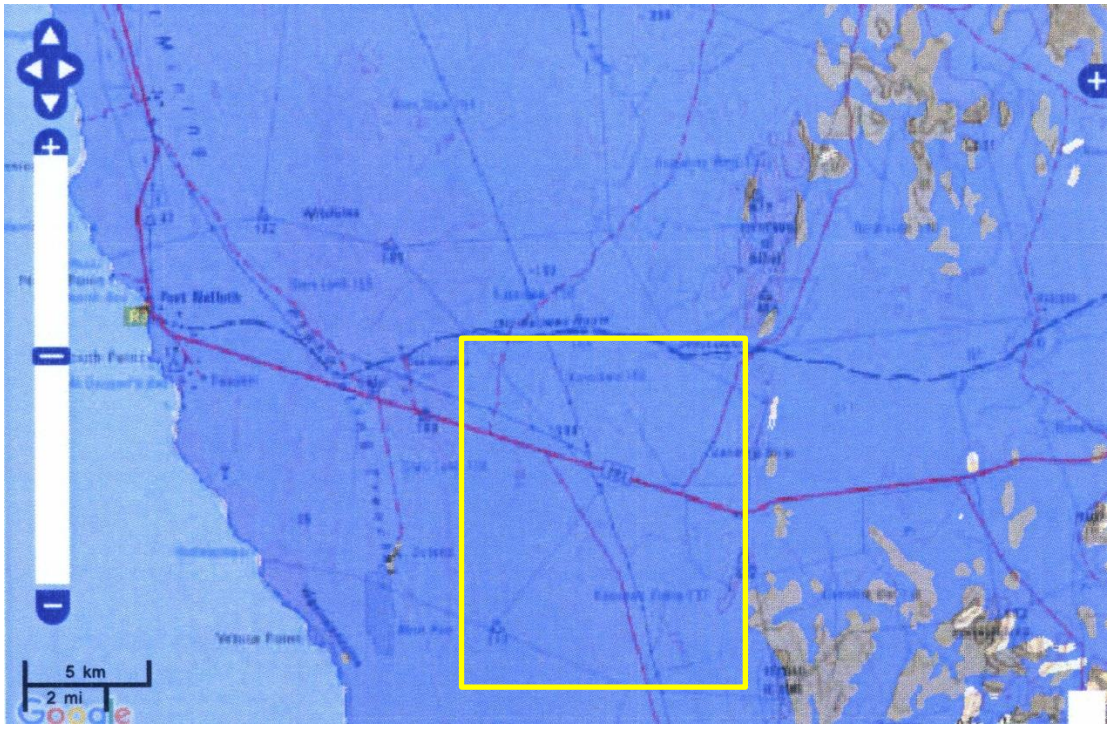

Figure 5: SAHRIS palaeosensitivity map for the site for the prospecting right application, Kannikwa 156 and Kannikwa Vlakte 157, shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above the area is indicated as low to zero sensitivity.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

Table 3a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.

	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Granites, gneiss, aeolian and alluvial sands do not preserve fossils; so far there are no published records of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be negligible
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be transported, robust fossils in the sands of the river beds, the spatial scale will be localised within the site boundary.
	M	-
	H	-

PART B: Assessment		
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area or in the granites and gneisses. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old and of the incorrect type to contain fossils (Namaqua Suite) or are transported sands derived from a non-fossiliferous source. Since there is an extremely small chance that transported fossils may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the granites, gneiss, quartzites, sandstones and sands are typical for the country and do not contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils because the material is transported and friable, however, there could be pebbles and cobbles in the rivers channels that are transported and rounded pieces of fossil wood.

6. Recommendation

Based on the lack of any previously recorded fossils from the Kannika farms area, it is unlikely that any fossils would be preserved in the sands and alluvium of the Quaternary. There is a very small chance that fossil woodss may occur in the palaeo-river beds and channels so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the contractor, environmental officer, or other responsible person once drilling, trenching or excavations have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be extremely low so the project should be authorised.

7. References

Bamford, M.K., Corbett, I.B. 1994. Fossil wood of Cretaceous age from the Namaqualand continental shelf, South Africa. Palaeontologia africana 31, 83-95.

Bamford, M.K., Corbett, I.B. 1995. More fossil wood from the Namaqualand coast, South Africa; onshore material. Palaeontologia africana 32, 67-74.

Briggs, D.E.G., McMahon, S., 2016. The role of experiments in the taphonomy of exceptional preservation. Palaeontology 59, 1-11.

Cornell, D.H., Thomas, R.J., Moen, H.F.G., Reid, D.L., Moore, J.M., Gibson, R.L., 2006. The Namaqua-Natal Province. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 325-379.

de Wit, M., Bhebhe, Z., Davidson, J., Haggerty, S.E., Hundt, P., Jacob, J., Lynn, M., Marshall, T.R., Skinner, C., Smithson, K., Stiefenhofer, J., Robert, M., Revitt, A., Spaggiari, R., Ward, J., 2016. Overview of Diamond Resources in Africa. Episodes 33(2), 199-237. DOI: 10.18814/epiiugs/2016/v39i2/95776

Partridge, T.C., Botha, G.A., Haddon, I.G., 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 585-604.

Roberts, D.L., Botha, G.A., Maud, R.R., Pether, J., 2006. Coastal Cenozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 605-628.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

8. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations / drilling / trenching activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations/trenching commence.
2. When excavations begin the rocks and sand must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (silicified wood, plants, insects, bone, coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 5). This information will be built into the EMP's training and awareness plan and procedures.

4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer/contractor then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

9. Appendix A – Examples of fossils from the Quaternary

Figure 6: Photographs of fossils that have been recovered from other parts of South Africa from Quaternary rivers, pans and abandoned channels. Note the fragmentary nature of these robust fossils.

10. Appendix B – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD
January 2022

I) Personal details

Surname	:	**Bamford**
First names	:	**Marion Kathleen**
Present employment	:	Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa
Telephone	:	+27 11 717 6690
Fax	:	+27 11 717 6694
Cell	:	082 555 6937
E-mail	:	marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) Academic qualifications
Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.
NRF Rating: C-2 (1999-2004); B-3 (2005-2015); B-2 (2016-2020); B-1 (2021-2026)

iii) Professional qualifications
Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations
Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative

ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees
All at Wits University

Degree	Graduated/completed	Current
Honours	13	0
Masters	11	3
PhD	11	6
Postdoctoral fellows	15	1

viii) Undergraduate teaching
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 45 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12-20 students per year.

ix) Editing and reviewing
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Associate Editor Open Science UK: 2021 -
Review of manuscripts for ISI-listed journals: 30 local and international journals
Reviewing of funding applications for NRF, PAST, NWO, SIDA, National Geographic, Leakey Foundation

x) Palaeontological Impact Assessments

Selected from the past five years only – list not complete:

- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for EnviroPro
- Skeerpoort Farm Mast 2020 for HCAC

- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for EnviroPro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe

xi) Research Output

Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 160 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 30; Google scholar h-index = 35; -i10-index = 92
Conferences: numerous presentations at local and international conferences.