Palaeontological Impact Assessment for the prospecting right application for Farm Wildebeest Kuil 69, northwest of Kimberley, Northern Cape Province

13279PR

Desktop Study (Phase 1)

For

Meridien Resources

23 June 2023

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Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf, PSSA
Experience: 34 years research and lecturing in Palaeontology
26 years PIA studies and over 350 projects completed

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Meridien Resources, 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 Palaeontological Impact Assessment was requested for the prospecting right application on Farm Wildebeest Kuil 69 by Wondokoz Trading (Pty) Ltd with reference: NC30/5/1/1/2/13279PR. The site is northwest of Kimberley, Northern Cape Province, and the project includes 10 drill sites and one camp site.

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 drill sites lie on the non-fossiliferous Allanridge Formation, on the highly fossiliferous Prince Albert Formation (Ecca Group, Karoo Supergroup) and Quaternary calcretes. Moderately fossiliferous Quaternary sands of the Gordonia Formation are widespread in the area. No fossils have been recorded from this area, nonetheless, 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 or other designated responsible person once excavations or drilling activities have commenced. Since the impact will be low, as far as the palaeontology is concerned, the project should be authorised.

Table of Contents

1. Background

A Palaeontological Impact Assessment was requested for the prospecting right application on Farm Wildebeest Kuil 69 by Wondokoz Trading (Pty) Ltd with reference: NC30/5/1/1/2/13279PR. The site is northwest of Kimberley, Northern Cape Province, and the project includes 10 drill sites and one camp site (Figures 1-3).

A Palaeontological Impact Assessment was requested for the Wildebeest Kuil 69 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
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

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
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 landmarks. The Farm Wildebeest Kuil 69 is shown by the white polygon.

Figure 2: Google Earth Map of the proposed prospecting right for ten drill sites on Farm Wildebeest Kuil 69, northwest of Kimberley (pins).

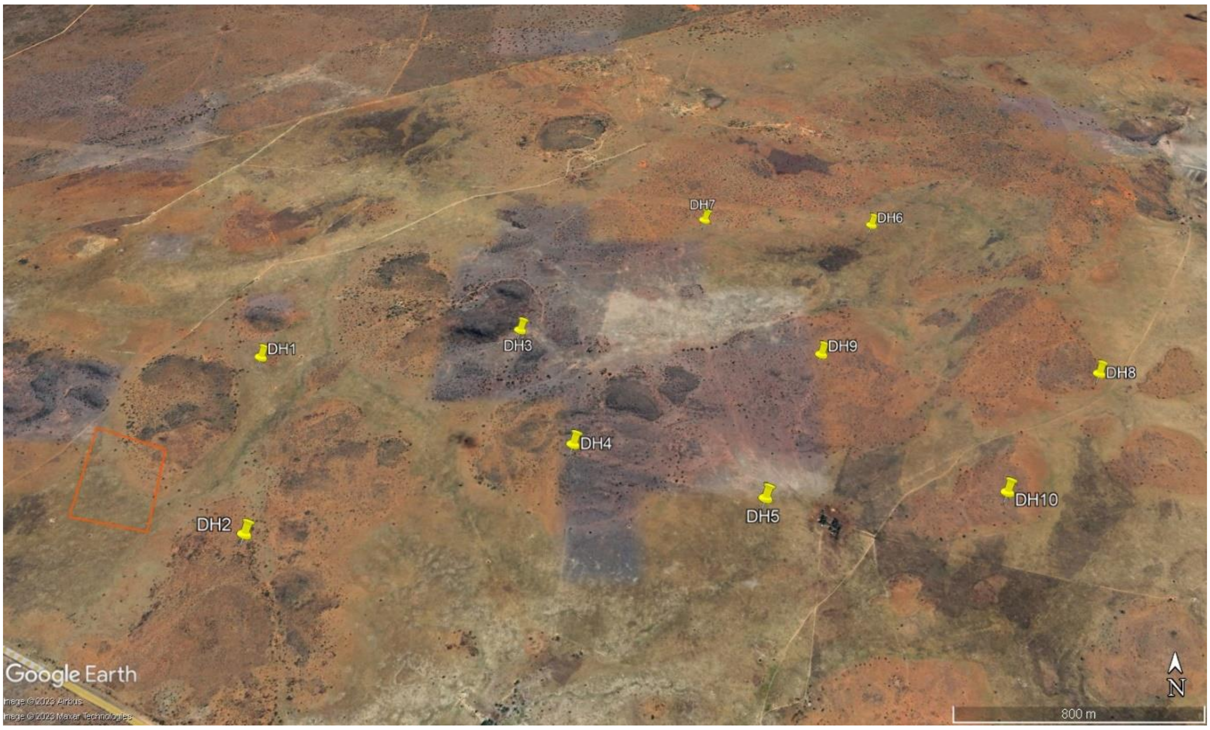

Figure 3: Google Earth map to show the positions of the ten drill sites (DH1 – DH10) and the camp site (orange rectangle) on the northern part of Farm Wildebeest Kuil 69.

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

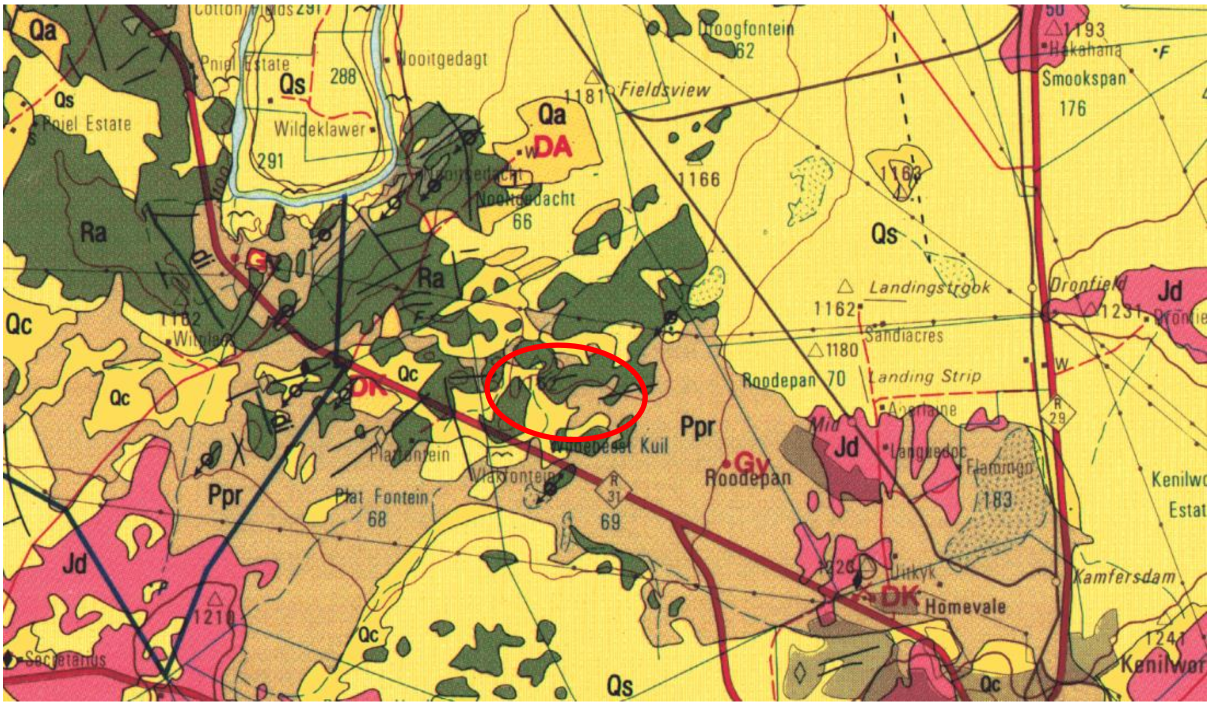

Figure 4: Geological map of the area around the Farm Wildebeest Kuil 69. The location of the proposed project is indicated within the red outline. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2824 Kimbreley.

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

Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary	Alluvium, sand, calcrete	Quaternary Ca 1.0 Ma to Present
Qc	Quaternary calcrete	Calcrete, sand	Quaternary Ca 1.0 Ma to Present
Qa	Quaternary alluvium	Sand, soil, alluvium	Quaternary Ca 1.0 Ma to Present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, Ca 183 Ma
Ppr	Prince Albert Fm, Ecca Group, Karoo SG	Shale	Early Permian, ca 290- 283 Ma
Ra	Allanridge Fm, Pniel Group, Ventersdorp SG	Mafic lava, tuff; amygdaloidal at base	Palaeoproterozoic 2664 – 2654 Ma

The project lies in the western part of the Main Karoo Basin where the older rocks of the Karoo sequence are present. The Karoo rocks unconformably overlie the much older volcanic rocks of the Ventersdorp Supergroup. Much of the area is unconformably overlain by the younger Quaternary sands, calcrete and alluvium (Figure 4).

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu

Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

Overlying the basal Dwyka Group glacigene rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the west and central part are the following formations, from base upwards: Prince Albert Formation, Whitehill Formation, Collingham Formation, Laingsburg / Ripon Formations, Tierberg / Fort Brown Formations, and Waterford Formation. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments.

Large exposures of Jurassic dolerite dykes occur throughout the area. These intruded through the Karoo sediments around 183 million years ago at about the same time as the Drakensberg basaltic eruption.

According to de Wit (1999) and Partridge et al., (2006) the history of post-Gondwana major rivers in the western part of South Africa is very important because these rivers were instrumental in the establishment of diamondiferous placers along the west coast of southern Africa. The evolution of the drainage system that developed after breakup of west Gondwana can be viewed in three timeslots: the middle to Late Cretaceous, the early to middle Cenozoic, and the late Cenozoic periods.

During the middle to Late Cretaceous there were two main river systems, the southern Karoo River, and the northern Kalahari River that was closer to the present day Orange River. Erosion by the palaeo rivers released most of the diamonds from the Cretaceous kimberlites in central South Africa at different times and they were transported by the Karoo River to the coast initially, and the Kalahari River later.

By early Cenozoic times, the lower Kalahari River had captured the upper part of the Karoo River and the present Orange River network was established. During the early and middle Cenozoic, the climate was arid to semiarid so there was much less erosion and transport of sediments, including diamonds, at the time.

Late Cenozoic fluvial gravels, however, contain diamonds that were reworked out of older Tertiary fluvial deposits of the Koa Valley and Sak River thus reworked diamonds were trapped in the Cretaceous Karoo River deposits or terraces. Although climatic changes were the major controls that initiated the alluvial pulses during the Cenozoic, asymmetric uplift of the subcontinent was ultimately responsible for the northwesterly shift of the Orange River.

There were two large basins dominating southern Africa during the Cenozoic, with the Kalahari Basin to the west and the Bushveld basin to the east. Both basins are bounded along their southern extent by the more or less west-east trending Griqualand-Transvaal Axis (Partridge et al., 2006). These sediments are not easy to date but recent attempts are gradually filling in the history of the sands, sand dunes and inter-dunes (Botha, 2021).

Quaternary Kalahari sands cover large parts of the rocks in this region, especially to the west. This is the largest and most extensive palaeo-erg in the world (Partridge et al., 2006) and is composed of extensive aeolian and fluvial sands, sand dunes, calcrete, scree and colluvium. Periods of aridity have overprinted the sands, and calcrete and silcrete are common. Most geological maps indicate these sands simply descriptively (aeolian sand, gravelly sand, calcrete) or they are lumped together as the Gordonia Formation because the detailed regional lithostratigraphic work has not been done, Nonetheless, these sands have eroded from the interior and have been transported by wind or water to fill the basin. Reworking of the sands or stabilisation by vegetation has occurred. Probable ages of dune formation are around 100 kya (thousand years), 60 kya, 27-23 kya and 17-10 kya (in Botha, 2021).

Along many of the rivers and watercourses are fluvially-transported sands and gravels that too are difficult to date. This sand is derived from the meandering channels and terraces and has been reworked in the past from rivers and re-captured rivers as the tectonic uplift has changed drainage patterns (de Wit, 1999; Botha, 2021). Human activities have also impacted the rivers and their sediment source.

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 5. The site for prospecting is on rocks of the Prince Albert Formation and Quaternary calcrete (orange; highly sensitive), Quaternary Gordonia Formation sands (green; moderately sensitive) and non-fossiliferous Allanridge Formation volcanic rocks (blue).

West and east of 24°E, the Ecca Group comprises the basal **Prince Albert Formation**, in the southwestern half of the Karoo Basin, and is composed of shales and silty shales. In the west where it overlies the Dwyka Group there are fining upward sequences of sandstones, siltstones, silty shales and rhythmites. Marine fossils such as cephalopods, lamellibranches and brachiopods, and fragmentary plant fossils and palaeoniscoid fish remains (Douglas area; McLachlan and Anderson, 1973). The southern facies of the Prince Albert Formation has darker shales, chert and carbonaceous nodules produced under a reducing environment, with rare marine fossil fragments (Johnson et al., 2006).

Fossils can be trapped in the Tertiary and Quaternary sands and alluvium but are seldom preserved there. Such fossils could be associated with palaeo-channels from rivers that have changed their course such as the palaeo Koa and Orange Rivers.

Along with diamonds, these cemented sands may also have trapped the more robust fossils, such as bone or silicified wood. These fossils would be fragmented and transported, so out of primary context, but such occurrences have been useful for determining the source of the rivers, their direction of flow, and the ages of rivers (de Wit and Bamford, 1993; de Wit et al., 2009). Some abandoned fluvial channels or palaeo-channels contain diamonds that have been transported from the source kimberlites, as well as fossil wood. Examples are from the palaeo-Sak River (Bamford and de Wit, 1993) that represent the palaeo-Karoo River, and along the palaeo-channels adjacent to the present day Orange River at Auchas (Pickford et al., 1996; Bamford, 2000).

According to Goudie and Wells (1995) there are two conditions required for the formation of pans. Firstly, the fluvial processes must not be integrated, and second, there must be no accumulation of aeolian material that would fill the irregularities or depressions in the land surface. Favoured materials or substrates for the formation of pans in South Africa are Dwyka and Ecca shales and sandstones (ibid). The Wildebeest Kuil Rock Art site and museum are well documented and protected (Morris, 2014).

The Allanridge Formation rocks are volcanic in origin and volcanic rocks do not preserve fossils. In addition, these volcanic rocks were emplaced during the Proterozoic and at that time the only life forms were microscopic algae.

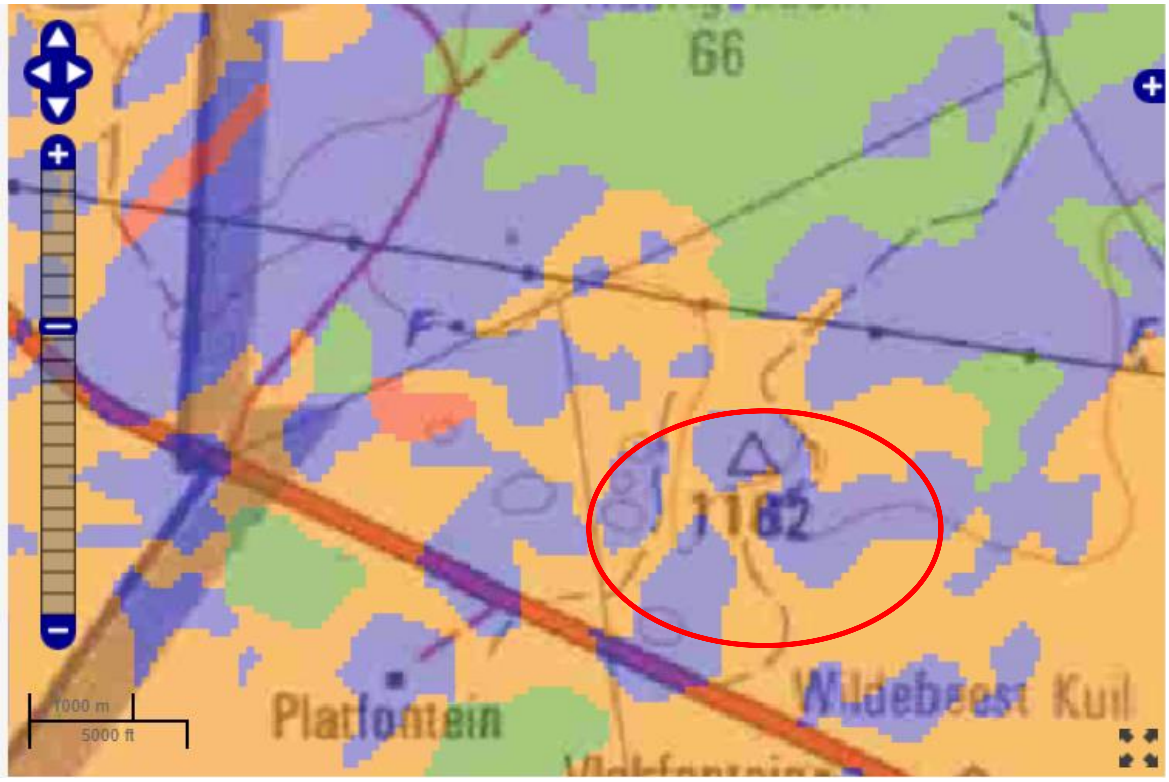

Figure 5: SAHRIS palaeosensitivity map for the site for the prospecting right< Wildebeest Kuil 29 shown within the red outline. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

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	Sands do not preserve fossils but might obscure pans; so far there are no records from the Quaternary calcrete 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.

PART B: Assessment		
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be fossils trapped in pans and calcrete, the spatial scale will be localised within the site boundary.
	M	-
	H	-
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 calcretes that will be drilled through. 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 the wrong type to contain fossils (volcanic) and much too old to contain body fossils. Calcretes may trap fossils. Sands and alluvium do not preserve fossils but might obscure traps. Since there is a very small chance that Quaternary fossils from calcretes may be present and 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 volcanic rocks, sandstones, shales and sands are typical for the country and only some may contain trace fossils or trapped fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils.

6. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying sands of the Quaternary or in the volcanic rocks. There is a very small chance that fossils may occur in Quaternary calcretes, possibly associated with palaeo-pans, so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once drilling operations 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 low, so as far as the palaeontology is concerned, the prospecting right should be granted.

7. References

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Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. 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 461 – 499.

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8. Chance Find Protocol

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

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone or 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 Figures 6-7). 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 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 Ecca Group and Quaternary sands

Figure 6: Photographs of trace fossil plants from the early Permian Ecca Group.

Figure 7: Photographs of fragmented and transported Quaternary fossils.

10. Appendix B – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD
January 2023

Present employment: Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DSI Centre of

Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa
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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.

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

v) **Supervision of Higher Degrees**

All at Wits University

Degree	Graduated/completed	Current
Honours	13	0
Masters	13	3
PhD	13	7
Postdoctoral fellows	14	4

vi) **Undergraduate teaching**
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year

Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12 - 20 students per year.

vii) **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: Cretaceous Research: 2018-2020
Associate Editor: Royal Society Open: 2021 -
Review of manuscripts for ISI-listed journals: 30 local and international journals

viii) **Palaeontological Impact Assessments**
25 years' experience in PIA site and desktop projects

- Selected from recent projects only – list not complete:
- 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
- Glosam Mine 2022 for AHSA
- Wolf-Skilpad-Grassridge OHPL 2022 for Zutari
- Iziduli and Msenge WEFs 2022 for CTS Heritage
- Hendrina North and South WEFs & SEFs 2022 for Cabanga
- Dealesville-Springhaas SEFs 2022 for GIBB Environmental
- Vhuvhili and Mukondelei SEFs 2022 for CSIR
- Chemwes & Stilfontein SEFs 2022 for CTS Heritage
- Equestria Exts housing 2022 for Beyond Heritage
- Zeerust Salene boreholes 2022 for Prescali
- Tsakane Sewer upgrade 2022 for Tsimba
- Transnet MPP inland and coastal 2022 for ENVASS
- Ruighoek PRA 2022 for SLR Consulting (Africa)
- Namli MRA Steinkopf 2022 for Beyond Heritage

ix) **Research Output**
Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 170 articles published; 5 submitted/in press; 14 book chapters.
Scopus h-index = 31; Google Scholar h-index = 39; -i10-index = 116 based on 6568 citations.
Conferences: numerous presentations at local and international conferences.