APPENDIX

# H-7 PALAEONTOLOGY

# Palaeontological Impact Assessment for the proposed Mukondeleli Wind Energy Facility, south of Secunda, Mpumalanga Province

**Desktop Study (Phase 1)**

**For**

**WSP**

**06 November 2022**

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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 WSP Africa, Bryanston, 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 proposed Mukondeleli Wind Energy Facility (WEF) to be located south of Secunda, Mpumalanga Province. This report is for the Mukondeleli WEF only and the grid infrastructure is the subject of a separate report.

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 WEF site lies predominantly on non-fossiliferous Jurassic dolerite with several small sections on potentially fossiliferous sediments of the Vryheid Formation (Ecca Group, Karoo Supergroup. 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 for poles or foundations 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

**Mukondeleli Wind Energy Facility Project Description**

**Site location**

The proposed Mukondeleli Wind Energy Facility (WEF) will have a project area of approximately 3600ha, with a maximum export capacity of up to 300 MW. Within this project area the extent of the buildable area will be determined subject to finalization based on technical and environmental evaluations and considerations.

The proposed Mukondeleli WEF and associated infrastructure are subject to a full Scoping and EIA process in terms of the 2014 NEMA EIA Regulations, as amended.

The proposed WEF is located in the Govan Mbeki Local Municipality, near the town of Secunda, in the Mpumalanga Province of South Africa. The project area covers 23 property portions. The details of the properties associated with the proposed Mukondeleli WEF, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in the table below:

| Portion Number | Farm Number | Farm Names | 21 Digit Surveyor General Code of each cadastral land parcel |
|---|---|---|---|
| 2 | 291 | Bosjesspruit | T0IS00000000029100002 |
| 6 | 291 | Bosjesspruit | T0IS00000000029100006 |
| 8 | 291 | Bosjesspruit | T0IS00000000029100008 |
| 9 | 291 | Bosjesspruit | T0IS00000000029100009 |
| 10 | 291 | Bosjesspruit | T0IS00000000029100010 |
| 11 | 291 | Bosjesspruit | T0IS00000000029100011 |
| 12 | 291 | Bosjesspruit | T0IS00000000029100012 |
| 13 | 291 | Bosjesspruit | T0IS00000000029100013 |
| 14 | 291 | Bosjesspruit | T0IS00000000029100014 |
| 9 | 313 | Knoppiesfontein | T0IS00000000031300009 |
| 0 | 314 | Knoppies | T0IS00000000031400000 |
| 2 | 316 | Brandwacht | T0IS00000000031600002 |
| 3 | 316 | Brandwacht | T0IS00000000031600003 |
| 4 | 316 | Brandwacht | T0IS00000000031600004 |
| 5 | 316 | Brandwacht | T0IS00000000031600005 |
| 13 | 316 | Brandwacht | T0IS00000000031600013 |
| 1 | 317 | van Tondershoek | T0IS00000000031700001 |
| 2 | 317 | van Tondershoek | T0IS00000000031700002 |
| 7 | 317 | van Tondershoek | T0IS00000000031700007 |
| 8 | 317 | van Tondershoek | T0IS00000000031700008 |
| 11 | 317 | van Tondershoek | T0IS00000000031700011 |
| 12 | 317 | van Tondershoek | T0IS00000000031700012 |
| 5 | 321 | Tweefontein | T0IS00000000032100005 |


**Figure 1: Google Earth map of the general area to show the relative land marks. The Mukondeleli WEF project is shown by the black outline (turbine positions MK-... subject to change).**

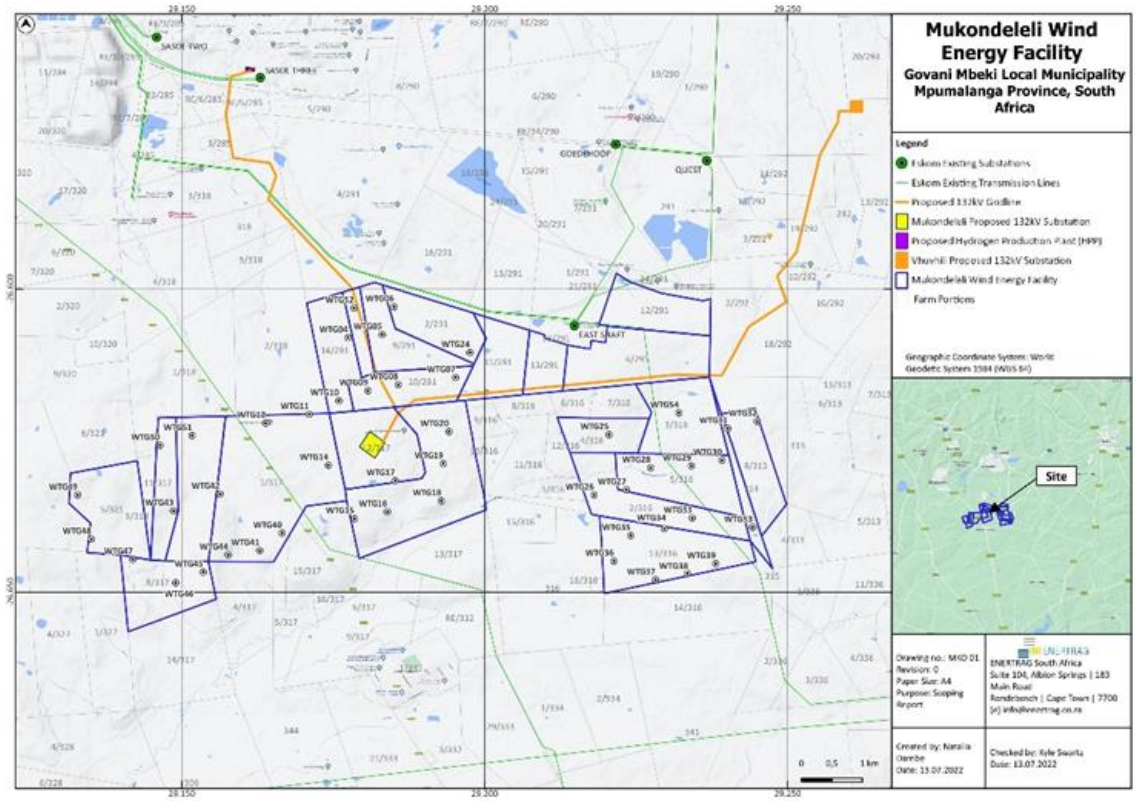


**Figure 2: Topographic map of the Mukondeleli WEF area with farm boundaries (blue) and the grid connections (orange, not for this report).**

**Project Infrastructure**

The proposed Mukondeleli WEF and associated infrastructure include the following components:

1. Up to 42 wind turbine generators (WTGs) with a maximum export capacity of 300 MW.
2. Turbines with a hub height of up to 200m and a rotor diameter of up to 200 m.
3. Hardstand areas of approximately 1 500m$^2$ per turbine.
4. Temporary construction laydown and storage area of approximately 4 500m$^2$ per turbine.
5. Medium voltage cabling connecting the turbines will be laid underground.
6. A Battery Energy Storage System (BESS) comprising of several utility scale battery modules within shipping containers or an applicable housing structure on a concrete foundation. Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however, the specific technology will only be determined following EPC procurement.
7. Internal roads with a width of up to 10m providing access to each turbine, the BESS, on-site substation (SS), step-down substation and laydown area. The roads will accommodate cable trenches and stormwater channels (as required) and will include turning circle/bypass areas of up to 20 m at some sections during the construction phase. As such, the roads and cables will be positioned within a 20 m wide corridor. Existing roads will be upgraded wherever possible, although new roads will be constructed where necessary.
8. A temporary construction laydown/staging area of approximately 4.5 hectares (ha) which will also accommodate the operation and maintenance (O&M) buildings.
9. A 33/132kV on-site SS to feed electricity generated by the proposed Mukondeleli WEF into the step-down substation at the Sasol facility. The on-site SS will accommodate 1 x 132 kV incoming feeder bay, 1x 132 kV outgoing feeder bay and a motorised isolator with protection and metering.

In addition to the wind turbines to be installed on the project site, the proposed development also comprises a 132 kV overhead power line (either single circuit or double circuit) and a step-down substation to feed the electricity generated by the project into a step down substation located on the Sasol Secunda facility which is between 5 and 10 km from the on-site SS. The 132 kV power line and step-down substation at Sasol is subject to a separate Basic Application to be undertaken by the applicant.

The key technical details for the Mukondeleli WEF are tabulated below:

| **Component** | **Description / Dimensions** |
|---|---|
| Site coordinates (centre point) | Lat 26°37'34.04"S; Long 29°10'24.53"E |
| Affected farm portion/s | Bosjesspruit 291 (Portions 2, 6, 8, 9, 10, 11, 12, 13 and 14) |

| Component | Description / Dimensions |
|---|---|
| | Brandwacht 316 (Portions 2, 3, 4, 5 and 13)<br>Knoppies 314 (Portion 0)<br>Knoppiesfontein 313 (Portion 9)<br>Tweefontein 321 (Portion 5)<br>Van Tondershoek 317 (Portions 1, 2, 7, 8, 11 & 12) |
| Application site area | Approximately 3600 ha |
| Total project footprint area (including the internal roads, but excluding access roads leading to the site) | To be determined during dEIA prior to phase |
| Total WEF export capacity | Up to 300 MW |
| BESS capacity | Up to 100 MW/400 MWh |
| Proposed technology | Wind turbines and associated infrastructure, including a BESS |
| BESS technology | Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however, the specific technology will only be determined following EPC procurement. |
| Number of turbines | Up to 42 turbines |
| Turbine hub height from ground | Up to 200 m |
| Turbine rotor diameter | Up to 200 m |
| Turbine blade length | Up to 100 m |
| Height of BESS | Approximately 5-10 m |
| Height of the on-site Substation | Approximately 7 – 10 m<br>Up to 22 m (including lighting) |
| On-site SS and BESS complex area | Combined footprint of up to 4ha |
| Construction laydown area | Up to 3ha footprint |
| Concrete tower manufacturing | Part of the construction laydown area. The applicability of a concrete tower manufacturing facility will only be confirmed following EPC procurement. Up to 10ha. |
| Temporary laydown area | Up to 2ha |
| O&M building area | Part of the substation and BESS complex and will include:<br>- Operations building of approximately 200m$^2$;<br>- Workshop and stores area of approximately 300m$^2$; and<br>- Refuse area for temporary waste storage and conservancy tanks to service ablution facilities. |
| Turbine hardstand area | Approximately 1 500m$^2$ per turbine |
| Width of internal access roads | Up to 10m, including turning circle/bypass areas of up to 20m. The roads and cables will be positioned within a 20m wide corridor. |

| Component | Description / Dimensions |
|---|---|
| Length of internal access roads | To be determined based on the final layout |
| Site access | R546 |
| Grid connection and proximity | Connection to step-down substation (to be built at Sasol Secunda facility)<br>Approximately 10km |
| Height of substation fencing | Up to 3 m high |
| Type of fencing | Galvanized steel / nonelectric diamond mesh (clearVu) |

A Palaeontological Impact Assessment was requested for the Mukondeleli WEF 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 |

| | **A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:** | **Relevant section in report** |
|---|---|---|
| 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 |
| 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 |

# 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 project lies in the central part of the main Karoo Basin where large exposures of non-fossiliferous Jurassic dolerite have intruded through the Vryheid Formation. Along the main water courses much younger, Quaternary, sands and alluvium overlie the much older Karoo rocks.

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.

During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea. These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin, and are known as the Dwyka Group (Johnson et al., 2006).

Overlying the Dwyka Group 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 central and eastern part are the following formations, from base upwards: Pietermaritzburg, **Vryheid** and Volksrust Formations. 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.

Overlying the Ecca Group are the rocks of the Beaufort Group that has been divided into two subgroups. As with the older Karoo sediments, the formations vary across the Karoo Basin. Overlying the Beaufort Group are the three formations of the Stormberg Group. They are absent from this part of the basin. 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.

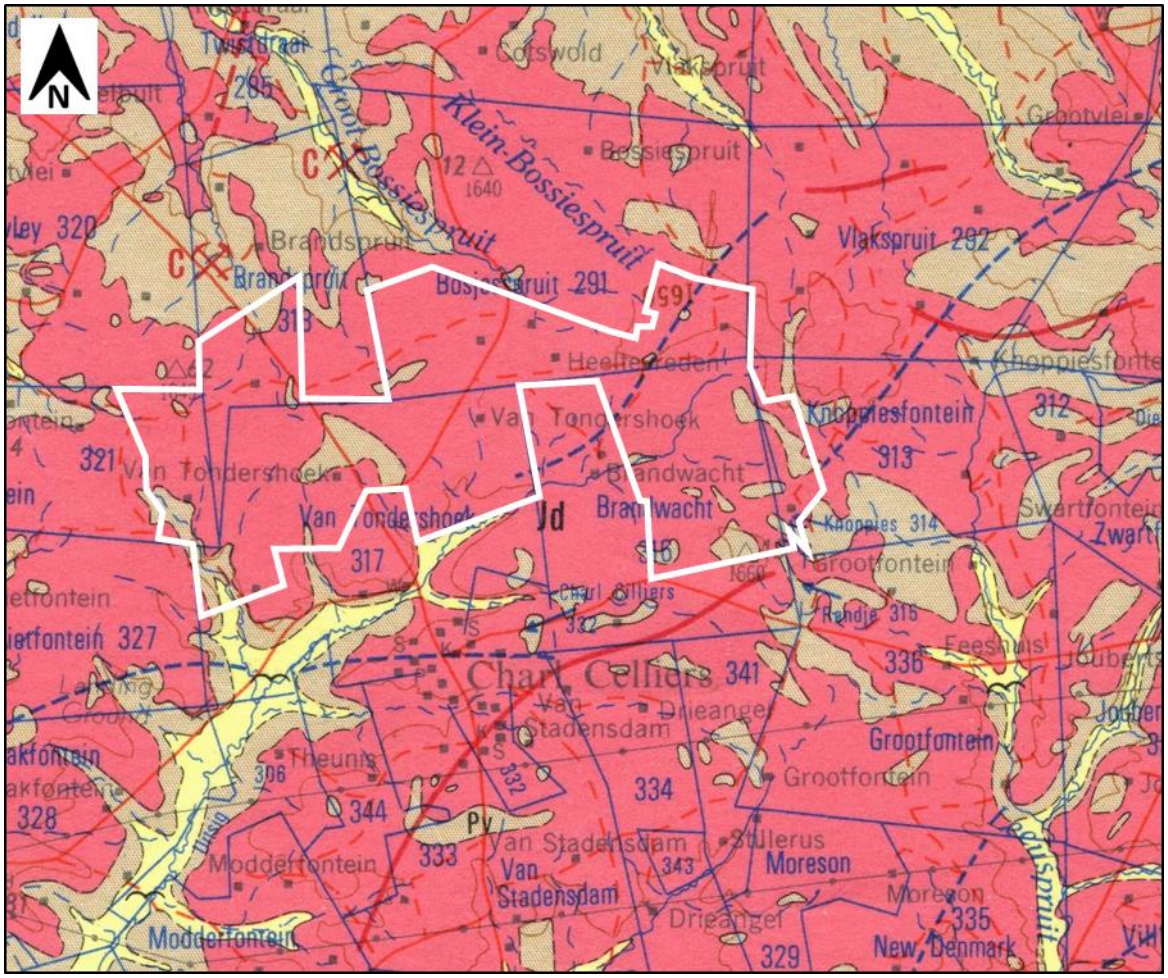


**Figure 3: Geological map of the area around the Mukondeleli WEF indicated within the white polygon. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2628 East Rand.**

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 |
|---|---|---|---|
| Q | Quaternary | Alluvium, sand, calcrete | Neogene, ca 2.5 Ma to present |
| Jd | Jurassic dykes | Dolerite dykes, intrusive | Jurassic, approx. 183 Ma |
| Pv | Vryheid Fm, Ecca Group, Karoo SG | Shale, mudstone, coal, sandstone | Middle Permian ca 266 – 260 Ma |

## ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The site for development mainly is in the Jurassic dolerite but there are a few outcrops of the Vryheid Formation.

The **Vryheid Formation** lies on the uneven topography of pre-Karoo or Dwyka Group rocks in the northern and northwestern margins, but lies directly on the Pietermaritzburg Formation in the central and eastern part. The lithofacies show a number of upward-coarsening cycles, some very thick, and they are essentially deltaic in origin. There are also delta-front deposits, evidence of delta switching, and fluvial deposits with associated meandering rivers, braided streams, back swamps or interfluves and abandoned channels (Cadle et al., 1993; Cairncross, 1990; 2001; Johnson et al., 2006). Coal seams originated where peat swamps developed on broad abandoned alluvial plains, and less commonly in the backswamps or interfluves. Most of the economically important coal seams occur in the fluvial successions (ibid). In the east (Mpumalanga and northern KwaZulu Natal), the Vryheid formation can be subdivided into a lower fluvial-dominated deltaic interval, a middle fluvial interval, and an upper fluvial-dominated deltaic interval again (Taverner-Smith et al., 1988).
Since dolerite is an igneous (volcanic) rock, it does not preserve any fossils. In fact, the dolerite usually destroys any fossils in its near vicinity that were present in the sediments through which it has intruded.

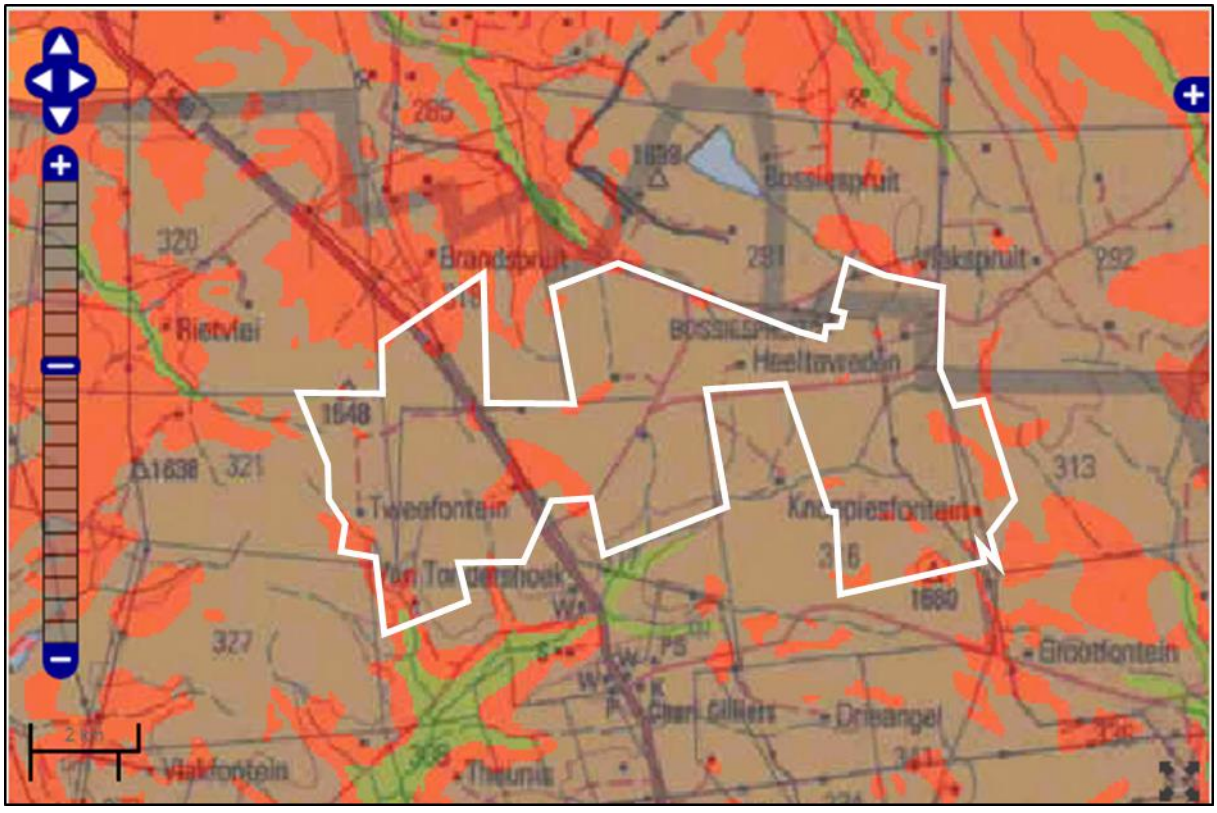


**Figure 4: SAHRIS palaeosensitivity map for the site for the proposed Mukondeleli WEF (within the white polygon. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.**

From the SAHRIS map above the area is indicated as having a few very highly sensitive areas on the Vryheid Formation (red) but mostly on zero sensitive rocks (grey) for the dolerite.

# 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** | Dolerite (intrusive volcanic rock)does not preserve fossils; so far there are no records from the Vryheid Fm 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+** | - |

| PART B: Assessment | | |
|---|---|---|
| | **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 fossil plants in the Vryheid Fm shales or mudstones, the spatial scale will be localised within the site boundary. |
| | **M** | - |
| | **H** | - |
| **PROBABILITY** | **H** | **-** |
| | **M** | Fossils do not occur in dolerite. It is unlikely that any fossils would be found in the loose soils and sands that cover the area but they possibly occur below ground in the Vryheid Fm, therefore, a Fossil Chance Find Protocol should be added to the eventual EMPr. |
| | **L** | - |

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 mostly the wrong kind to contain fossils (dolerite and covering soils. Since there is a small chance that fossils may occur below ground in the Vryheid Formation 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 dolomites, sandstones, shales and sands are typical for the country and only some contain fossil plant, insect, invertebrate and vertebrate material. The dolerite and the overlying soils and sands of the Quaternary period would not preserve fossils. It is not known if the project excavations will reach the shales below ground, or if the shales have any fossil plants preserved in them. There are no coal mines in the project footprint so it is unlikely that any coal seams of economic value are present. It is known that dolerite destroys any fossils in its vicinity as the hot lava bakes the adjacent sediments through which it intrudes.

# 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 dolerite or in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below in the shales of the early Permian Vryheid Formation 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 excavations for foundations and amenities have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. Since the impact on the palaeontology would be low, as far as the palaeontological heritage is concerned, the project should be authorised provided that the fossil chance find protocol (Section 8) is followed for the small areas that lie on the Vryheid Formation (see figures 3-4):

Southwestern margin Farm 321
Northern margin Farm Brandwacht 316
Central part along R546 on Farm Tweefontein 321
Western margin Farm Knoppiesfontein 313.

There are no no-go areas and no cumulative impact as each site is unique.

# 7. References

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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 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 contractor/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 Vryheid Formation.

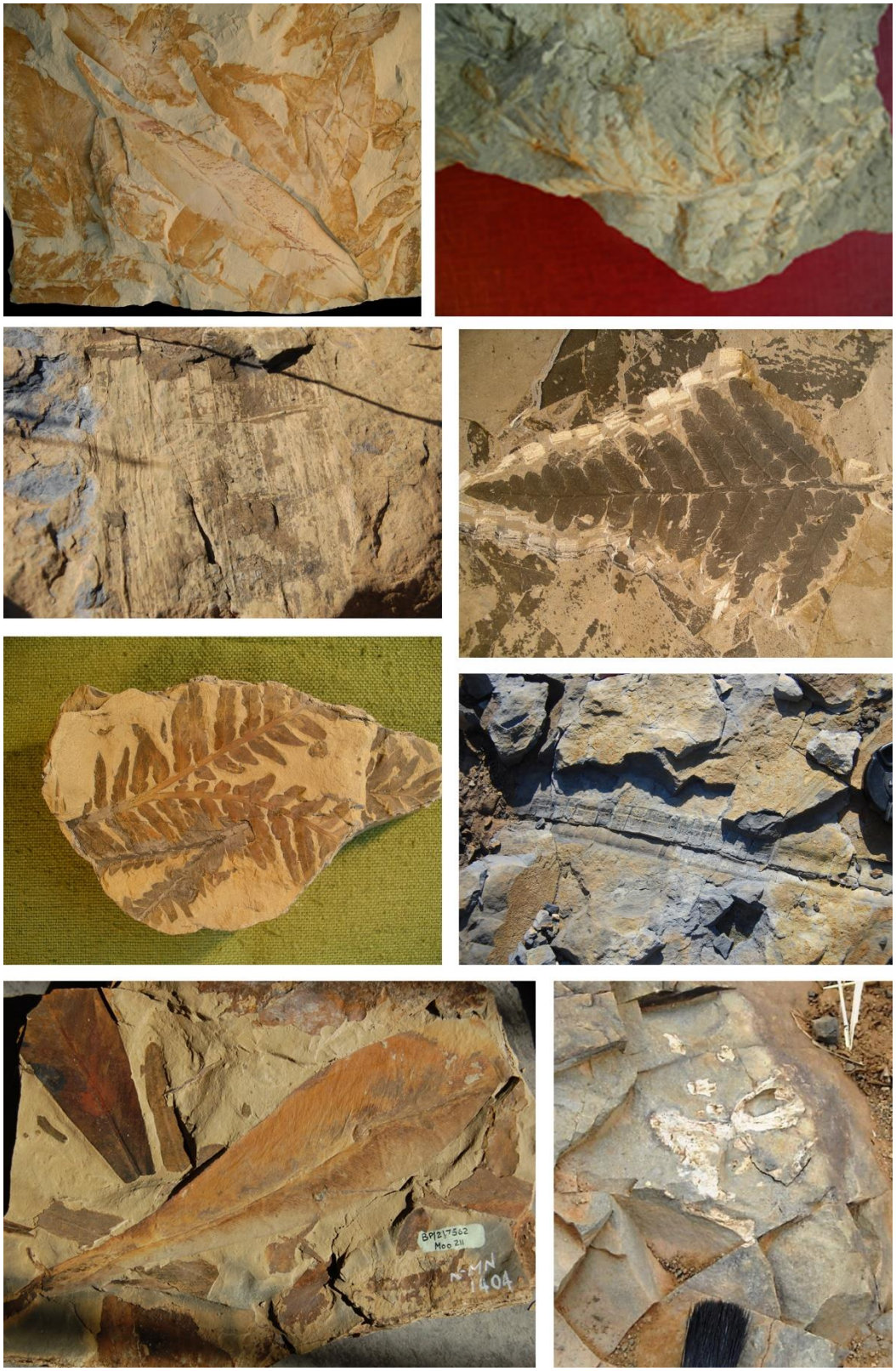


**Figure 5: Photographs of fossil plants of the *Glossopteris* flora as seen in the field.**

## 10. Appendix B – Details of specialist

# Curriculum vitae (short) - Marion Bamford PhD
# July 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 July 2022 peer-reviewed journals or scholarly books: over 165 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.