APPENDIX

F-4 PALAEONTOLOGY

Palaeontological Impact Assessment for the proposed Grid Connection for the Impumelelo WEF, near Secunda, Mpumalanga Province

Desktop Study (Phase 1)

For

ASHA Consulting (Pty) Ltd

27 January 2023

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Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf
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 ASHA Consulting (Pty) Ltd, Lakeside, 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 Grid Connection for the Impumulelo Wind Energy Facility (WEF) between Greylingstad and Secunda, Mpumalanga Province, and southwest of the Impumelelo Coal Mine. **The proposed grid connection to the northeast to Zandfontein Substation is the subject of this report**. Two alternatives for the route are under consideration.

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), desktop (Phase 1) Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed grid connection routes in the north-eastern sector lie almost entirely on the potentially fossiliferous Vryheid Formation (Ecca Group, Karoo Supergroup) that could preserve fossils of the *Glossopteris* flora. In the south-western sector, where the alternate routes differ, the routes are on non-fossiliferous dolerite. The observations from the site visit by the archaeologist showed that the grid routes are already disturbed by current and earlier agriculture, existing roads and other infrastructure. He saw no fossils on the land surface in the small 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 for pole foundations have commenced. Any impact would only occur during the Construction Phase. **As far as the palaeontology is concerned, the impact pre-mitigation will be moderate negative and post-mitigation very low; there is no preferred route and there is no no-go area**. There will be a low impact during the construction phase only.

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1. Background

ASHA Consulting (Pty) Ltd was appointed by WSP for ENERTRAG South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur through the proposed construction of the Grid Connection for the Impumelelo Wind Energy Facility (WEF) located between Greylingstad (to the southeast) and Secunda (to the northwest), Mpumalanga (Figures 1-2). The project would have a maximum export capacity of up to 200 MW. An approximate mid-point for the study area is S26° 40' 05" E28° 51' 10". The project is proposed across nine farm portions as shown in Table 1.

The proposed grid connection from the Impumelelo WEF north eastwards to the Eskom Zandfontein Substation is the subject of this report. The proposed Impumelelo grid connection and associated infrastructure include various components as listed in Table 2. Figure 2 shows the proposed project layout.

Table 1: Farms and farm portions affected by the proposed Grid Connection for the Impumelelo WEF.

Portion No.	Farm No.	Farm Name
3	130	Zandfontein
2	130	Zandfontein
5	130	Zandfontein
8	130	Zandfontein
9	130	Zandfontein
0	279	Grootspruit
1	280	De Bank of Vaalbank
2	280	De Bank of Vaalbank
4	280	De Bank of Vaalbank
6	280	De Bank of Vaalbank
2	528	
3	528	Kafferfontein?
9	528	Kaalspruit
6	528	
7	528	Kaalspruit
16	323	Roodebank
0	542	
3	535	
4	535	Holgatsfontein
20	535	Holgatsfontein
18	535	Holgatsfontein
17	535	Holgatsfontein
19	535	Holgatsfontein
16	535	Holgatsfontein
15	535	
14	535	Holgatsfontein
3	535	Holgatsfontein

Portion No.	Farm No.	Farm Name
17	535	Holgatsfontein
0	529	
2	543	Platkop
4	543	Platkop
5	543	Platkop
9	543	Platkop
3	277	Sprinbokdraai
5	277	
2 (8)	277	Sprinbokdraai
5	277	Sprinbokdraai
20	323	Roodebank
3	130	
1	534	Wolvenfontein
18	534	Wolvenfontein
19	534	Wolvenfontein
20	534	Wolvenfontein
16	532	
0	544	Mahemsfontein
7	544	Mahemsfontein
8	544	Mahemsfontein
25	522	Hartbeestfontein
6	522	Hartbeestfontein

Table 2: Project details for the Impumelelo WEF Grid Connection.

Facility Name	Impumelelo WEF Grid Connection
Applicant	Impumelelo Wind (Pty) Ltd (Registration Number: 2022/601923/07
Municipalities	The project is located in the Dipaleseng Local Municipality of the Gert Sibande District Municipality
Affected Farms	Refer to **Error! Reference source not found.**
Powerline corridor length	Approx.~34km (To be confirmed prior to construction)
Powerline assessment corridors width	500m (250m either side of centre line)
Powerline servitude	32m per 132kV powerline **Option 1 (~33km)** **Option 2 (~34km)**
Powerline pylons:	Monopole or Lattice pylons, or a combination of both where required
Powerline pylon height:	Maximum 40m height
Temporary laydown or staging area:	Typical area 220m x 100m = 22000m^2.

	Laydown area could increase to 30000m^2 for concrete towers, should they be required.
Site access	R547 and R23
Height of substation fencing	Up to 3 m high Galvanised steel
Substation area	2.5 ha (to be located adjacent to the Impumelelo WEF substation)

The proposed project entails the construction of up to 132kV transmission line from the onsite substation to the Zandfontein Substation as per the following alternatives:

Grid Connection Alternative 1 (Preferred): The proposed powerline will be approximately ~33 km and will connect to the Impumelelo WEF to the Zandfontein Substation via the onsite substation located on portion 5/543 of Farm Platkop (preferred substation – Option 1). This alternative spans over existing road and farm boundaries.
The preferred pylon and powerline will be 132 kV Intermediate Self-Supporting single circuit or double circuit. The powerline will have a 500m (250m on either side of centre line) assessment corridor to allow for micro-siting.

Grid Connection Alternative 2: The proposed powerline will be approximately 34 km and will connect to the Impumelelo WEF to the Zandfontein Substation via the onsite substation located on portion 0/544 of Farm Mahemsfontein. This alternative spans across the WEF around the Carmona Substation thereafter following the existing road and farm boundaries.

Figure 1: Google Earth map to show the whole project area (blue rectangle) and relevant landmarks. The Impumelelo WEF is in the southwest sector.

Figure 2: Impumelelo WEF grid route. Green block and line are the Alternative 1 substation and powerline, Blue is Alternative 2). Secunda is in the northeast and Greylingstad in the southwest of the sites.

Table 3: 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 3
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix 3
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

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
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	Spring
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	None
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;	Figures 2-4
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 1
l	Any conditions for inclusion in the environmental authorisation	Appendix 1
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix 1
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 include 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 site lies in the northeastern part of the main Karoo Basin where the basal sediments are exposed (Figure 3). The Karoo sediments unconformably overlie the rocks of the Transvaal Supergroup sequence.

The Karoo Supergroup rocks cover a very large proportion of South Africa. They are 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. 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).

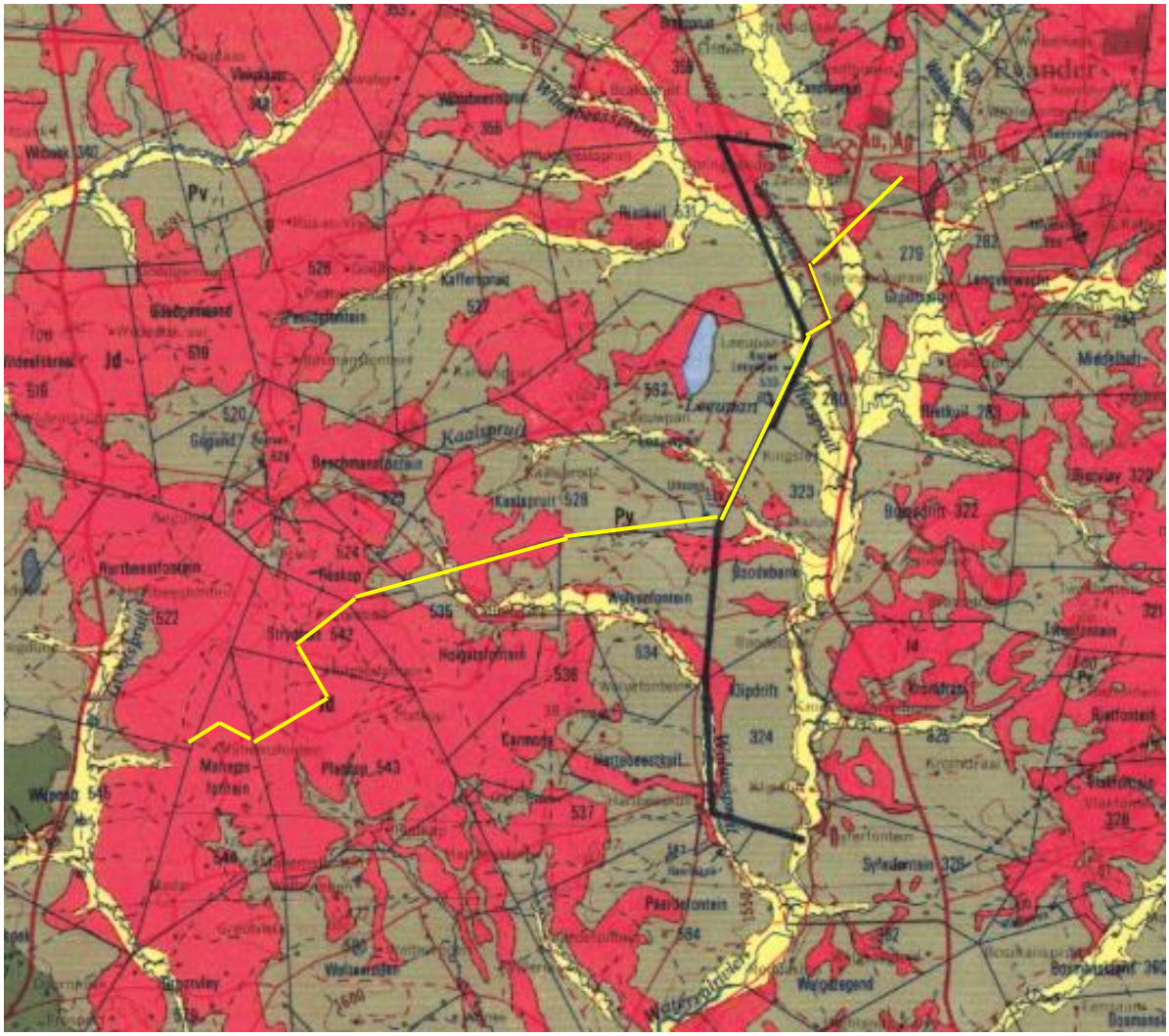

Figure 3: Geological map of the area around the Impumelelo WEF and proposed power lines. Yellow line is the proposed grid connection route. NB – western section with alternates all on dolerite. Abbreviations of the rock types are explained in Table 4. Map enlarged from the Geological Survey 1: 250 000 map 2628 East Rand.

Table 4: Explanation of symbols for the geological map and approximate ages (Johnson 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 sand	Aeolian sand, with gravelly areas (triangles)	Neogene, ca 2.5 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Pv	Vryheid Fm, Ecca Group, Karoo SG	Shales, sandstone, coal seams	Early Permian, ca 280 Ma
Rk	Klipriviersberg Group, Ventersdorp SG	Mafic lava, amygdaloidal lava, tuff	Neoproterozoic

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 Free State, Mpumalanga and KwaZulu Natal, from the base upwards are the Pietermaritzburg Formation, **Vryheid Formation** and the Volksrust 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.

Intruding through the Karoo sediments are numerous dolerite dykes associated with the massive basalt outpouring of the Jurassic aged Drakensberg Group. Such volcanic rocks do not preserve fossils.

Much younger sediments of Quaternary age have been deposited as alluvium and soils along the rivers and streams.

ii. Palaeontological context

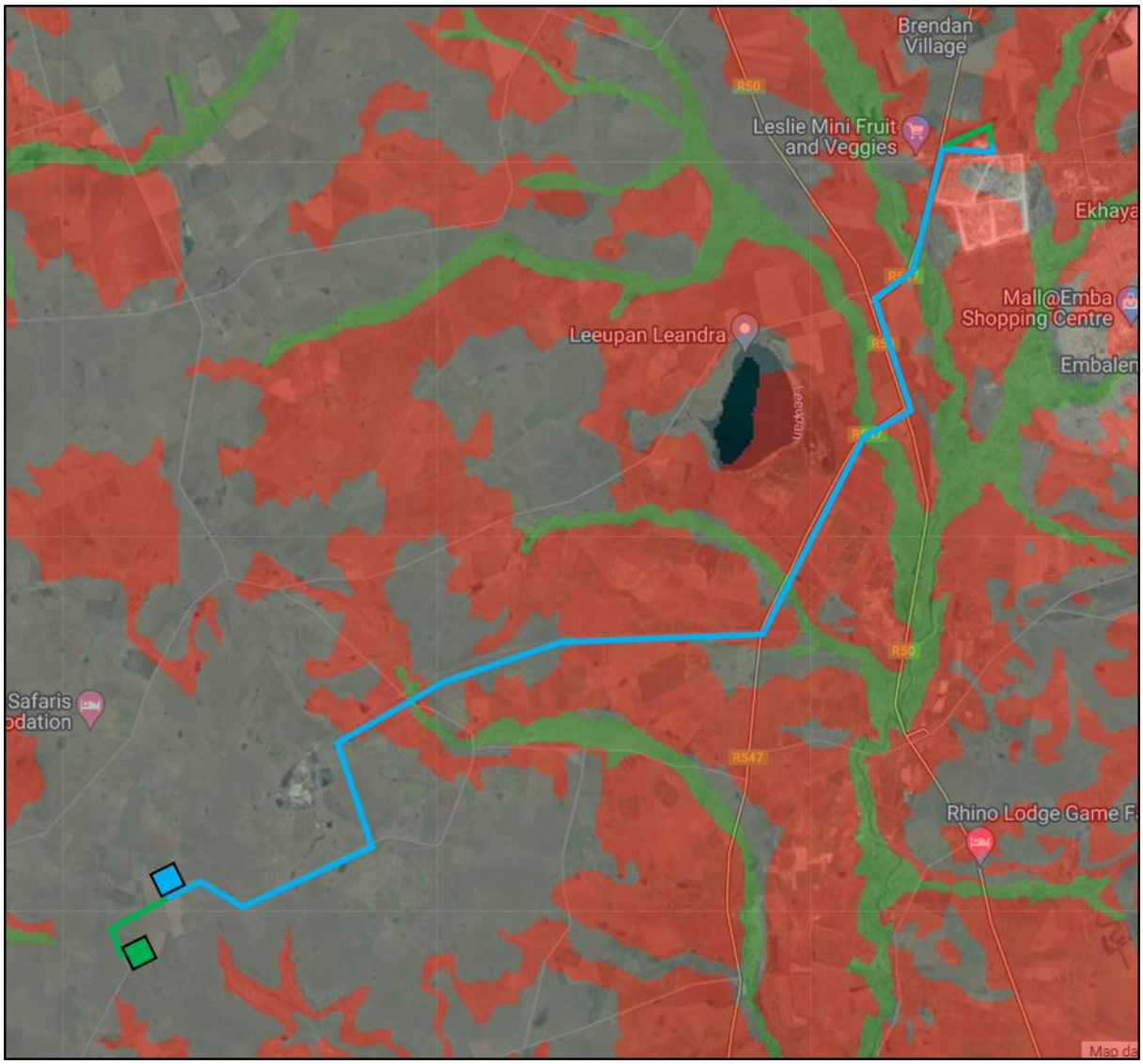

Figure 4: SAHRIS palaeosensitivity map for the site for the proposed Grid Connection for the Impumelelo WEFs. Background colours indicate the following degrees of sensitivity:

red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

The palaeontological sensitivity of the proposed grid connection route for the Impumelelo WEF consideration are presented in Figure 4. The route lies mostly on potentially highly fossiliferous shales of the Vryheid Formation that is considered very highly sensitive for palaeontology so a site visit is required by SAHRA.

The fossils preserved in the Vryheid Formation are plants only and vertebrates are unknown. The plants are those of the *Glossopteris* flora comprising *Glossopteris* leaves, fructifications, wood and roots, and other plants such as lycopods, sphenophytes, ferns and early gymnosperms. Although the Vryheid Formation shales and sandstones are potentially fossiliferous, fossils are sporadic and their occurrence is unpredictable. Fossils do not occur in the coal seams as this organic material has been greatly altered by heat and compression to form coal. Soils are weathered products of sediments and so not contain any recognisable fossil material.

Dolerite is an igneous rock and does not preserve fossils and any fossils in close vicinity to the dolerite are usually destroyed by the intrusion.

iii. Site visit preparation and observations

Part of the route was surveyed by the archaeologist for archaeology, and only within the WEF area. Observations from a distance and from Google Earth show the obvious soils inferred from vegetation cover and crops. The doleritic area and the shales were all covered by soils that have been ploughed for agriculture. Some lands are also lying fallow and they are covered by deep soils and secondary grassland. No rocky outcrops remain (if ever present) in the visited area and no fossils were seen by the archaeologist. Most of the route is along existing powerline routes, farm borders, coal conveyor belt and farm roads. The rest of the routes lie in recently or previously ploughed fields that would not have fossils because any stones have been removed before ploughing. Rocky outcrops, therefore should be targeted as there might be impressions of fossil plants in the shales of the Vryheid Formation.

The topography is almost flat with a few undulating areas so it was easy to see quite far in the search for rocky outcrops. (Figures 5-7; photographs taken by Jaco van der Walt).

The southwestern part of the proposed powerline route where the two alternates pass either north and west of the mine tailings, or east and south of the mine tailings, are all on dolerite so no fossils were expected.

Figure 5A – general view of undulating lands covered with deep soils and secondary grassland. Conveyor belt along the left.

Figure 5B – typical view of a road-side exposure area showing deep, dark soils and grassland in the background. No rocks and no fossils.

Figure 6A – another roadside that is disturbed; flat fields with grasslands. No rocky outcrops.

Figure 6B – roadside with alien trees in the background along a farm boundary fence. Generally flat with no rocky outcrops..

Figure 7A – western side of the mine tailings

Figure 7B – northeastern route. Soil cover and no fossils

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in **Error! Reference source not found.**. It is only the project footprint / ground surface that is relevant to each route, in particular the pole foundations and substation foundations.

WSP is investigating the grid connection route from the proposed Impumelelo WEF to the Eskom Zandfontein Substation that traverses a number of farms (Figure 3). NOTE – Alternate Route 1 and Alternate Route 2 only differ in the southwestern section that runs on non-fossiliferous dolerite, therefore as far as the Palaeontology is concenred, they are the same

Assessment of Impacts and Mitigation

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

Following the mitigation sequence/hierarchy of five levels:

a) Avoid/prevent significant impact
b) Minimise
c) Rehabilitate/restore
d) Off-set
e) No-go,

mitigation in the form of removing any important fossils (steps a and b) will reduce realty the impact of this project on the palaeontological heritage.

The key objectives of the risk assessment are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Ranked criteria listed in Table 5a and the scores for the palaeontological impact are given in Table 5b.

Table 5a: Impact Assessment and Scoring according to WSP protocols.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

Table 5b: Impact Assessment score and significance for Palaeontology for the Impumelelo GRID connection project.

Project: Impumelelo GRID connection – both Alternate Routes 1 and 2		
Criteria (from table above)	Scores	
	Pre-mitigation	Post-mitigation
Impact Magnitude (M)	2	1
Impact Extent (E)	1	1
Impact Reversibility (R)	3	1
Impact Duration (D)	5	2
Probability of Occurrence (P)	3	1
Significance (M+E+R+D) x P	(2+1+3+5) x 3 = 36	(1+1+1+2) x 1 = 5

Significance Rating	Moderate	Very Low
Negative / Positive	Negative	Positive

Mitigation
The impact on the palaeontological heritage can be reduced greatly by a palaeontologist conducting a pre-construction site visit to look for fossils and removing any scientifically important fossils with the relevant SAHRA permit.
(See Section 8 and Appendix A).

Positive/Negative Impact
The discovery and removal of fossils as a direct result of this project has a positive impact because prior to this the particular fossils or fossil deposit were unknown to science.

Alternative Routes
As far as the palaeontology is concerned both routes are the same. They only differ in the southwestern section where both routes are on non-fossiliferous dolerite.

Additional Environmental Impacts
As far as the palaeontology is concerned, there are no additional impacts because the fossils are inert and inactive.

Cumulative Impacts
As far as the palaeontology is concerned, there are no cumulative impacts because each site is unique and may or may not have fossils. Fossil bones may be scattered over the landscape but their distribution is erratic and unpredictable. If a bone-bed or plant outcrop occurs this would an aerially small concentration of fossils and very unlikely to extend beyond tens of metres. Therefore, projects on adjacent land parcels are unlikely to add any impact on this project.

No-Go areas
There are no-go areas because the fossils, if present, can be removed ad curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material.

Only the **construction phase** could have any impact on the palaeontology because this is when the ground will be excavated and any fossils, if present, would be removed (Annexure 2). During the operational and decommissioning phases no new ground will be excavated so there will be no impact.

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 overlying soils and 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 and soils of the Quaternary. There is a very small chance that fossils may occur in the shales below ground of the early Permian Vryheid Formation 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 excavations for foundations and infrastructure 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, therefore as far as the palaeontology is concerned the project should be authorised. There is no preferred route and there is no no-go area.

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.

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.

Snyman, C.P., 1998. Coal. In: Wilson, M.G.C., and Anhaeusser, C.P., (Eds). The Mineral Resources of South Africa: Handbook, Council for Geosciences 16, 136-205.

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 8). 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.

Appendix A – Examples of fossils from the Vryheid Formation

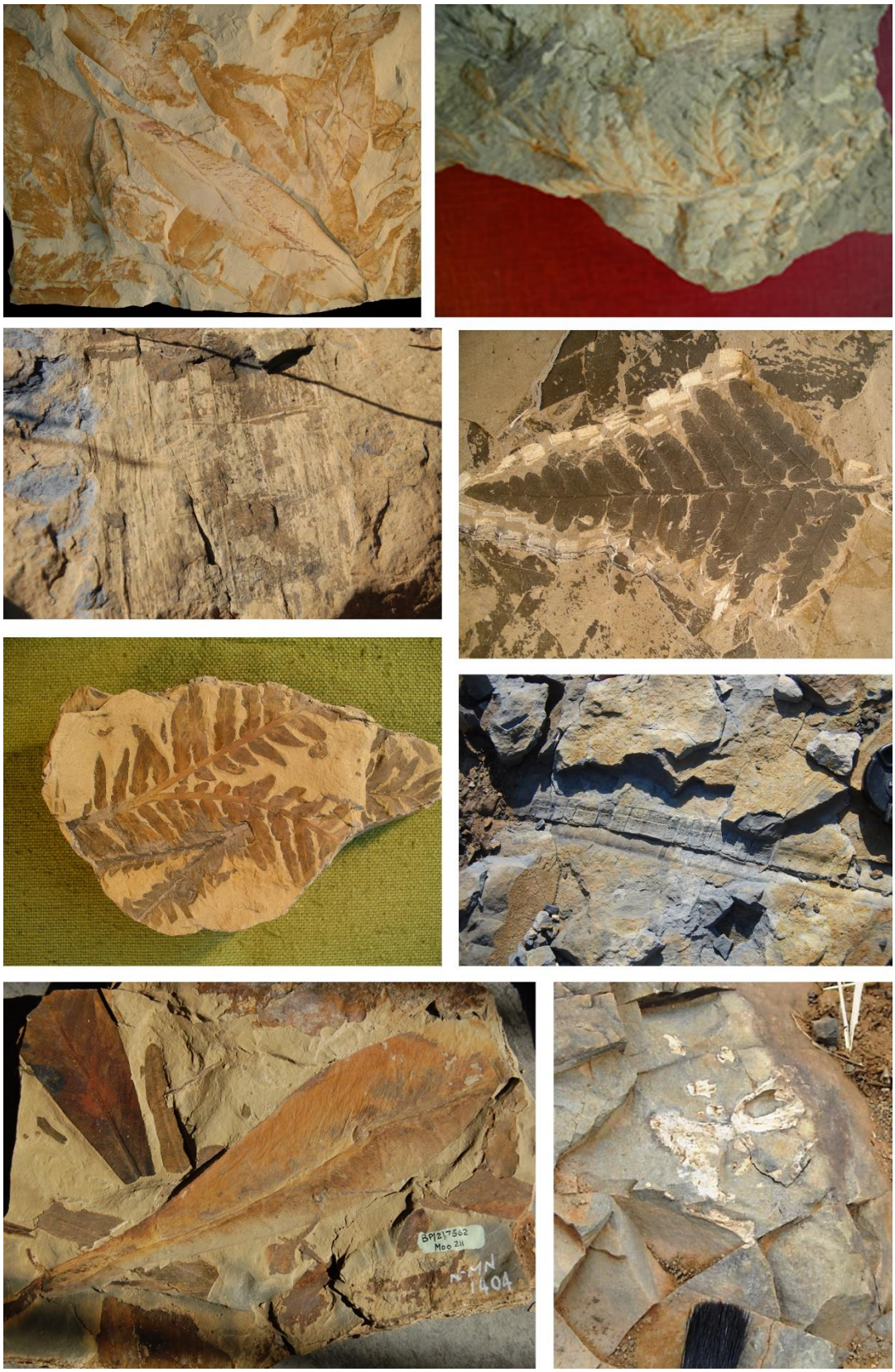

Figure 8: Photographs of fossil plants that could occur below ground in shales.

11. Appendix B – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD
January 2023

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	13	3
PhD	13	6
Postdoctoral fellows	15	4

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 2023 peer-reviewed journals or scholarly books: over 170 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 30; Google scholar h-index = 39; -i10-index = 116
Conferences: numerous presentations at local and international conferences.