

**Palaeontological Impact Assessment for the proposed
Eskom Sekgame-Bulkop-Sishen Project,
Northern Cape Province.**

Desktop Study

For

Landscape Dynamics Environmental Consultants

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Expertise of Specialist

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Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf

Experience: 30 years research; 20 year PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Landscape Dynamics Environmental Consultants, South Africa. The views expressed in this report are entirely those of the author and Landscape Dynamics and no other interest was displayed during the decision making process for the project.

Specialist: Prof Marion Bamford.....

Signature:



Executive Summary

The desktop Palaeontological Impact Assessment for the proposed project by Eskom for the commissioning of two adjacent power lines between new Sekgame Switching Station to the existing Bulkop/Ferrum 132kV line and the decommissioning of the old lines has been done. The overlying Kalahari sands are most unlikely to contain any in situ fossils of significance. The underlying rocks are too old to contain any body fossils but there is a very small chance that stromatolites could occur far below the foundations for the towers, infrastructure and stations. If stromatolites are encountered then it is recommended that a small sample be sent to a palaeontologist to assess for microfossils (algae). It is concluded that the project may continue as far as the paleontology is concerned.

Palaeontological Impact Assessment for the proposed Eskom Sekgame-Bulkop-Sishen Project, Northern Cape Province.

1. Background

The proposed Eskom Sekgame-Bulkop-Sishen Project has two aspects: the construction of two new adjacent powerlines and the decommissioning of two existing lines.

The project involves the construction of two new 132kV power lines:

- A ±6km 132kV power line from the new Sekgame Switching Station to the existing Bulkop/Ferrum 132kV line
- A ±6km 132kV power line from the new Sekgame Switching Station to the existing Ferrum/Sishen 132kV line.
- Above-mentioned lines will be constructed adjacent to each other (see Fig 1.).

It furthermore entails the decommissioning of two existing power lines:

- A section of the existing 132kV Bulkop-Ferrum powerline line as well as a section of the existing Ferrum-Sishen power line will be decommissioned. The lines to be decommissioned run from the Ferrum Substation up to the connection point of the new lines as proposed with the existing Bulkop-Ferrum and Ferrum-Sishen lines.

The National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998) requires that the proposed development must be preceded by the relevant impact assessment, in this case for palaeontology.

This report complies with the requirements of the NEMA and environmental impact assessment (EIA) regulations (GNR 982 of 2014). The table below provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (2014)

A specialist report prepared in terms of the Environmental Impact Regulations of 2014 must contain:	Relevant section in report
Details of the specialist who prepared the report	Prof Marion Bamford
The expertise of that person to compile a specialist report including a curriculum vitae	Palaeontologist (PhD Wits 1990) CV attached
A declaration that the person is independent in a form as may be specified by the competent authority	Page 2
An indication of the scope of, and the purpose for which, the report was prepared	Section 1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	n/a Seasons make no difference to fossils
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	See table 2
An identification of any areas to be avoided, including buffers	n/a

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 description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	n/a
Any mitigation measures for inclusion in the EMPr	n/a
Any conditions for inclusion in the environmental authorisation	n/a
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	n/a
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	n/a
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	n/a
A description of any consultation process that was undertaken during the course of carrying out the study	n/a
A summary and copies if any comments that were received during any consultation process	n/a
Any other information requested by the competent authority.	n/a

2. Methods and Terms of Reference

1. In order to determine the likelihood of fossils occurring in the affected area geological maps, literature, palaeontological databases and published and unpublished records must be consulted.
2. If fossils are likely to occur then a site visit must be made by a qualified palaeontologist to locate and assess the fossils and their importance.
3. Unique or rare fossils should either be collected (with the relevant South African Heritage Resources Agency (SAHRA) permit) and removed to a suitable storage and curation facility, for example a Museum or University palaeontology department or protected on site.
4. Common fossils can be sacrificed if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

The published geological and palaeontological literature, unpublished records of fossil sites, catalogues and reports housed in the Evolutionary Studies Institute, University of the Witwatersrand, and SAHRA databases were consulted to determine if there are any records of fossils from the sites and the likelihood of any fossils occurring there.

Eskom Sekgame-Bulkop-Sishen Project

Preferred Route Alternative 1 & Route Alternative 2

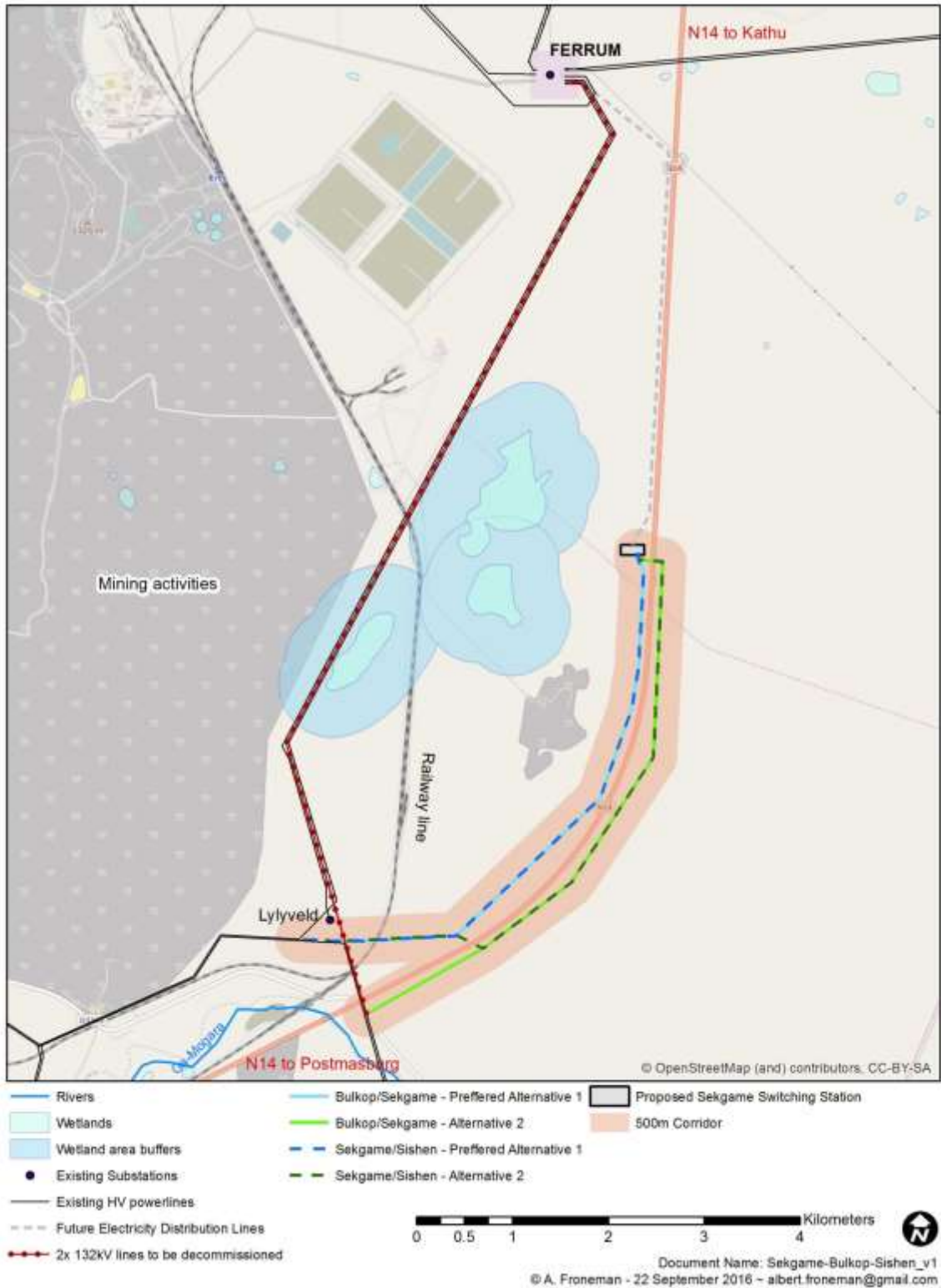


Figure 1: Locality of proposed Sekgame-Bulkop-Sishen powerline project, Northern Cape Province. Map provided by Landscape Dynamics.

3. Consultation Process

No consultations were carried out during the desktop study. Apart from reviewing interested and/or affected party (IAP) comments received by the EIA consultant during the EIA process, no other consultation took place as part of the paleontological study.

4. Geology and Palaeontology

Project location and geological setting

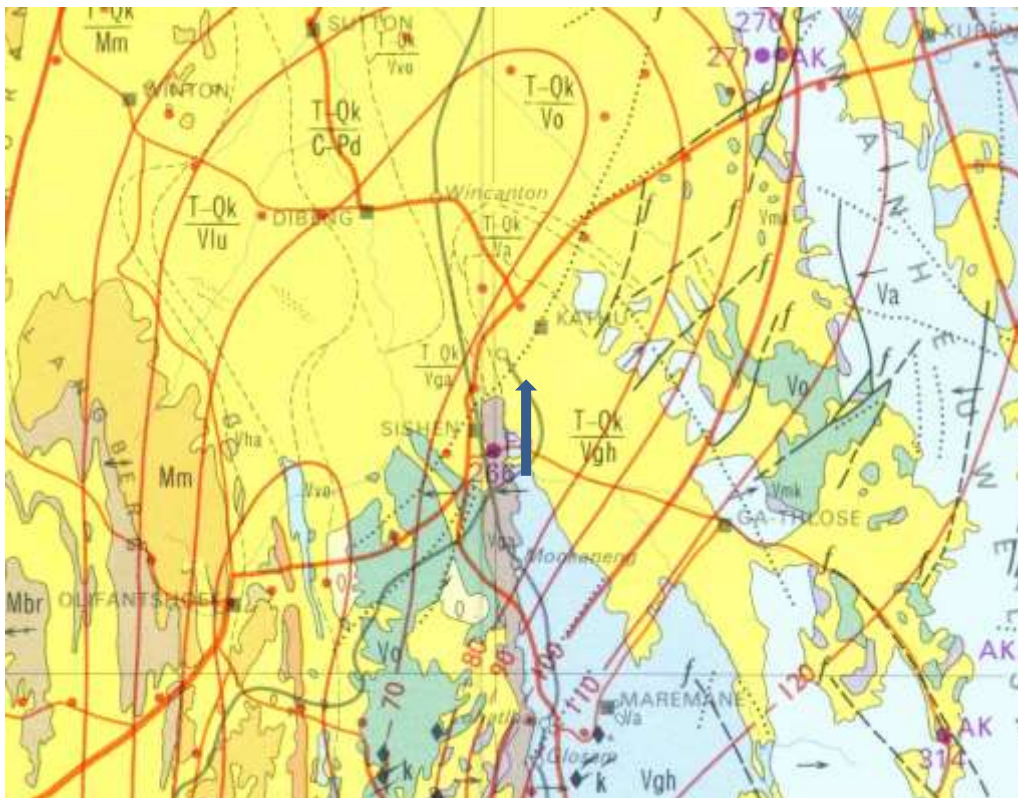


Figure 2: Geological map of the area around the proposed Sekgame-Bulkop-Sishen project. The approximate location of the proposed project is indicated with the arrow. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Table 2: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006; Moen, 2006). SG = Supergroup; Fm = Formation.

Symbol	Group/Formation	Lithology	Approximate Age
TQk/Vgh	Kalahari overlying Ghaap Plateau	Sands, alluvium	Last 2.5 Ma
Mm	Matsap SG, Volop Group, Olifantshoek SG	Subgreywacke, quartzite, conglomerate; red-	2000 – 1700 Ma

Symbol	Group/Formation	Lithology	Approximate Age
		brown arenites	
Vo	Ongeluk Fm	Flood basalts; andesite	2222 Ma
Vga	Gamagara Fm; Olifantshoek SG	Shale, quartzite, basaltic lava, conglomerate	
Va	Asbestos Hills SG	Iron formation; jasperlite	2500 Ma
Vgh	Ghaap Plateau Group	Dolomite, limestone, chert; rare stromatolites	2626 – 2430 Ma

Geology

The proposed site for the powerlines is on sands and alluvium of the Cenozoic Kalahari Group and they overlie the dolomites, sandstones and cherts of the ancient Ghaap Plateau Group. Other rocks in the vicinity are also ancient, comprising banded iron formations and dolomites as the only sedimentary rocks, otherwise they are volcanic in origin. They range in age from over 2600 Ma to 2222 Ma.

Palaeontology

Most of the rocks in this area are too old for body fossils of plants or animals but there are some rare stromatolites in the Ghaap Plateau Group which are in fact trace fossils of ancient algal colonies. They are formed by the layers of chemicals (Calcium carbonate, Calcium sulphate, Magnesium carbonate and Magnesium sulphate and others) that have been laid down by the photosynthesizing algae, however, the microscopic algae themselves are seldom preserved. Stromatolites have also been reported from the Kuruman Member of the Ghaap Plateau at Lime Acres but this is far to the east of the proposed site (Altmann and Schopf, 1995; Altmann, 2001). Furthermore, the stromatolites were seen in borehole cores and not near the ground surface.

The Kalahari sands could contain younger fossils but these are probably not in situ and are extremely rare; these sites are usually associated with archaeological finds, for example Kathu Pan and Wonderwerk Cave. According to the SAHRIS map this area requires a desktop palaeontological assessment which is presented here. After consulting all the records available there are no published or unpublished reports of fossils in the zone of the proposed Sekgame-Bulkop-Sishen project.

5. Impact assessment

TABLE 3: 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

The surface activities would not impact on the fossil heritage as any fossils would have been disturbed by the earlier road-building exercise, and also severely weathered by the harsh environment. The IMPACT is nil (according to the scheme in Table 3).

Excavation for the power line towers and infrastructure for the stations would penetrate only a few metres below ground surface. Any potential stromatolites in the area are only known from borehole cores, i.e. much deeper than a few metres, so there would be minor deterioration of the site and no impact on people. Therefore the SEVERITY/NATURE of the environmental impact would be L.

DURATION of the impact would be permanent: L.

Since only the possible fossils within the area are well below ground the SPATIAL SCALE will be localised within the site boundary: L.

There is a very small chance of finding fossils in the top few metres and these would be stromatolites which are trace fossils and seldom have any organisms preserved within them. However, the PROBABILITY of affecting any fossils is unlikely or seldom: L

6. 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, cherts, basaltic lavas and banded iron formations are typical of other deposits to the south and east that have been cored. Any potential stromatolites would occur well below the few metres that the excavations for towers and infrastructure would penetrate for this project.

The decommissioning of the two older powerlines would not affect any potential fossiliferous deposits as the foundations and excavations were completed years ago.

7. Recommendation

While it is possible that stromatolites could occur well below surface and that they might contain microfossils of algae, it is highly unlikely that they will be affected by these relatively shallow excavations for foundations. No fossils have been reported from this particular area, only from far to the east. A site visit is therefore not required.

If stromatolites are discovered during the excavations for foundations and infrastructure, then it is strongly recommended that a sample be sent to a professional palaeontologist, preferably a palaeobotanist, so that a thin section can be made and examined for microfossils.

If the fossil material is deemed to be of scientific interest then further visits by a professional palaeontologist would be required to collect more material. Their importance can then be properly assessed, and if significant a SAHRA permit should be obtained to recover more material for research. It is of the opinion of the palaeontologist that no further palaeontological impact assessment is required, and as far as the paleontology is concerned, the project can proceed.

9. References

Altermann, W., 2001. The oldest fossils of Africa – a brief reappraisal of reports from the Archean. *African Earth Sciences* 33, 427–436.

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