

**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE
PROPOSED DEVELOPMENT OF LOG CABINS AND
ASSOCIATED INFRASTRUCTURE WITHIN THE
OORLOGSKLOOF NATURE RESERVE, NORTHERN CAPE
PROVINCE**

For:

Environmental Consultants:

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DATE: 18 October 2012

By



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EXECUTIVE SUMMARY

Metsi-Metseng Geological and Environmental Services CC was appointed by IKAMVA Consulting to undertake a desktop survey, assessing the potential palaeontological impact of the proposed development of 10 log cabins, pedestrian bridges and hydraulic structures for motor vehicle crossings within the Oorlogskloof Nature Reserve located within the Northern Cape Province.

This report forms part of the Environmental Impact Assessment for the development of log cabins and associated infrastructure within the Oorlogskloof Nature reserve and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999.

The proposed development is situated within the Oorlogskloof Nature Reserve within the Northern Cape Province towards the south west of Nieuwoudtville within the Northern Cape Province. The proposed development consists of the construction of 10 log cabins throughout the Oorlogskloof Nature Reserve, pedestrian crossings and hydraulic structures.

A basic assessment of the topography and geology of the area was made by using appropriate geological (1:250 000, 3118 Calvinia) maps in conjunction with Google Earth. The only limitation on this methodology is the scale of mapping, which restricts comparison of the geology to the 1:250 000 scale. This restriction only applies in areas where major changes in the geological character of the area occur over very short distances or on the geological transformation zones.

A review of the literature on the geological formations underlying the development site and the fossils that have been associated with these geological strata was undertaken.

The study area is mainly underlain by Namibian aged rocks of the Besonderheid -, Kalk Gat – and Dolkraals Formations of the Knersvlakte Subgroup of the Vanrhynsdorp Group and Silurian aged rocks of the Skurweberg Formation of the Nardouw Subgroup of the Table Mountain Group, which forms part of the Cape Supergroup.

The desktop survey indicates that most of the areas earmarked for the construction of the log cabins, pedestrian bridges and hydraulic structures are underlain by the Knersvlakte Subgroup, which has a moderate palaeontological sensitivity. Three of the log cabins and 2 pedestrian bridges are located on the Nardouw Subgroup which has a low palaeontological sensitivity.

Although the Knersvlakte Subgroup is rich in trace fossils the individual developments of the log cabins, pedestrian bridges and hydraulic structures will have a very small footprint area. This small footprint together with the very shallow excavations will not pose a great disturbance to the fossil heritage of the area.

It is thus recommended that the development can proceed without further palaeontological investigation needed. However, the contractor responsible for the construction of the log cabins, pedestrian bridges and hydraulic structures must be made aware of the fact that trace fossils such as burrows can be expected to occur within the development sites, especially if excavations will penetrate the underlying bedrock. In the event that some of these trace fossils are found during excavations, a qualified palaeontologist must be appointed to assess the significance of the find and to apply for the necessary permits from SHARA for the rescue and/or destruction of these fossils.

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1. INTRODUCTION

Metsi-Metseng Geological and Environmental Services CC was appointed by IKAMVA Consulting to undertake a desktop survey, assessing the potential palaeontological impact of the proposed development of 10 log cabins, pedestrian bridges and hydraulic structures for motor vehicle crossings within the Oorlogskloof Nature Reserve located within the Northern Cape Province.

1.1. Legal Requirements

This report forms part of the Environmental Impact Assessment for the development of log cabins and associated infrastructure within the Oorlogskloof Nature reserve and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the log cabins, pedestrian bridges and hydraulic structures.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

2. PROPOSED DEVELOPMENT DESCRIPTION

The proposed development is situated within the Oorlogskloof Nature Reserve within the Northern Cape Province towards the south west of Nieuwoudtville within the Northern Cape Province. The proposed development consists of the construction of 10 log cabins throughout the Oorlogskloof Nature Reserve, pedestrian crossings and hydraulic structures. The location of the Oorlogskloof Nature Reserve with the location of the proposed developments within the Reserve can be seen in Figure 2.1.



Figure 2.1 Locality map of Oorlogskloof Nature Reserve and proposed developments

3. AIMS AND METHODS

Following the “SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports” the aims of the PIA were:

- identifying exposed and subsurface rock formations that are considered to be palaeontologically significant;
- assessing the level of palaeontological significance of these formations;
- commenting on the impact of the development on these exposed and/or potential fossil resources;
- making recommendations as to how the developer should conserve or mitigate damage to these resources.

A basic assessment of the topography and geology of the area was made by using appropriate geological (1:250 000, 3118 Calvinia) maps in conjunction with Google Earth. The only limitation on this methodology is the scale of mapping, which restricts comparison of the geology to the 1:250 000 scale. This restriction only applies in areas where major changes in the geological character of the area occur over very short distances or on the geological transformation zones.

A review of the literature on the geological formations underlying the development site and the fossils that have been associated with these geological strata was undertaken.

4. GEOLOGY OF THE AREA

The study area is mainly underlain by Namibian aged rocks of the Besonderheid -, Kalk Gat – and Dolkraals Formations of the Knersvlakte Subgroup of the Vanrhynsdorp Group and Silurian aged rocks of the Skurweberg Formation of the Nardouw Subgroup of the Table Mountain Group, which forms part of the Cape Supergroup. Large Jurassic aged dolerite dykes cut the Namibian and Silurian sequence in the northern part of the reserve (Figure 4.1).

4.1. The Knersvlakte Subgroup

4.1.1. The Besonderheid Formation (Nbs)

The Besonderheid Formation consists of green shales, siltstones, sandstones and conglomerates which is inter-bedded with shales, limestone and chert towards the southeast.

4.1.2. The Kalk Gat Formation (Nkg)

The Kalk Gat Formation consists mainly of green and purple mudstones with subordinate sandstones and shales.

4.1.3. The Dolkraals Formation (Ndo)

The Dolkraals Formation is consists of siltstones which is green, grey and red in colour, inter-bedded with mudstones shales and sandstones.

4.2. The Nardouw Subgroup

4.2.4. The Skurweberg Formation (Ss)

The Skurweberg Formation is characterised by fairly thick bedded, medium to course grained sandstone which is light grey in colour. Considerable cross-bedding is displayed within the sandstones. Current and wave ripple marks are also visible within the Formation.

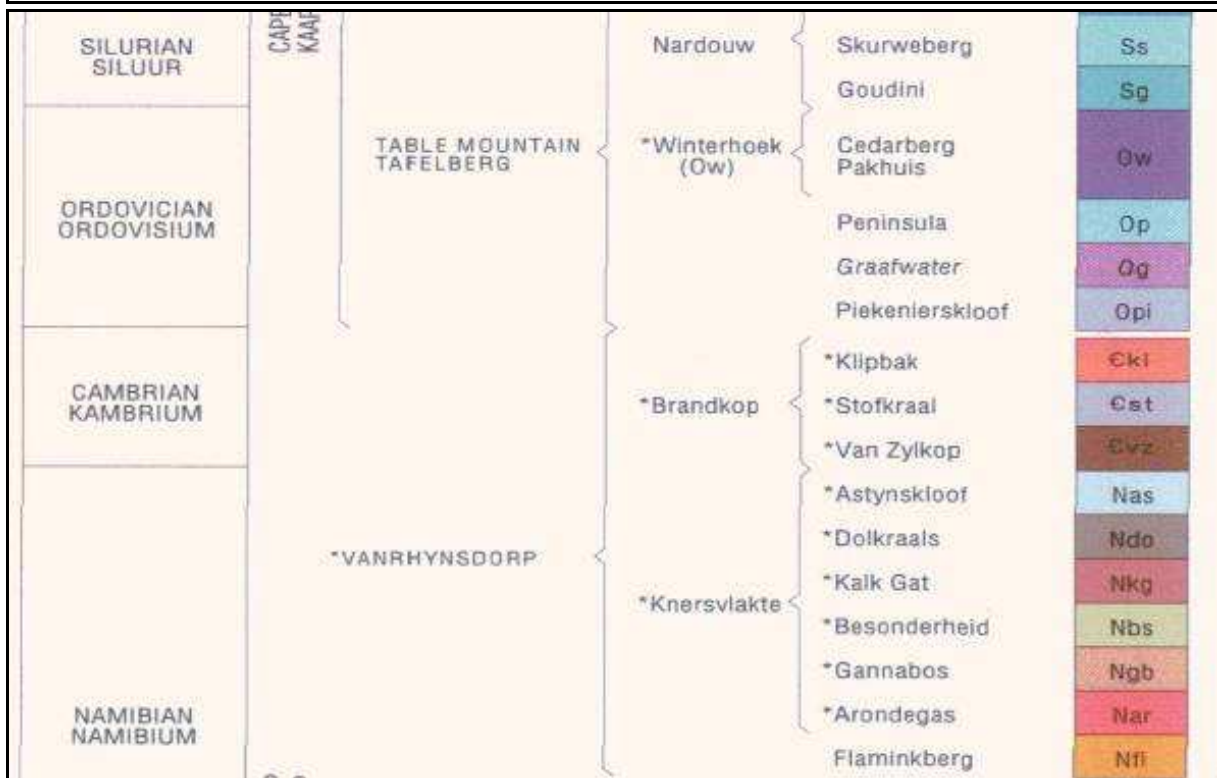
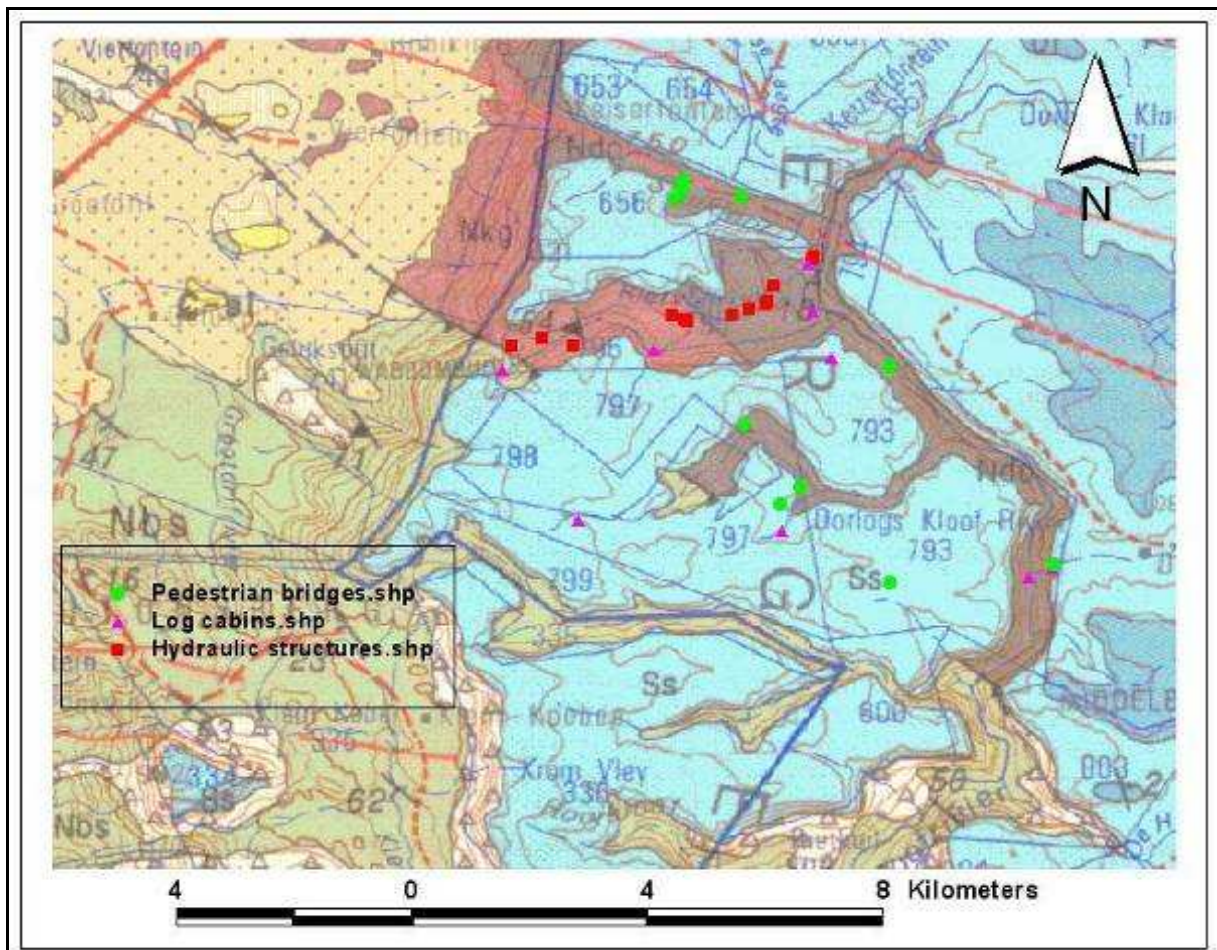


Figure 4.1 Geology of the study area of the Oorlogskloof Nature Reserve (Geo Map 3118 Calvinia)

5. PALAEOLOGY OF THE AREA

5.1. The Knersvlakte Subgroup

Abundant but low diversity trace fossil assemblage's e.g. large horizontal burrows, *Oldhamia*, *Treptichnus*, *Monomorphichnus*. Large columnar stromatolites, possible vendobiontan tool marks, microbial mats (Almond and Pether, 2009).

5.2. The Nardouw Subgroup

Sparse marine, estuarine and fluvial trace fossil assemblages (trilobite burrows, *Skolithos* "pipe rock", horizontal burrows) within the more mudrock-rich part of the succession (Almond and Pether, 2009).

6. PALAEOLOGICAL SIGNIFICANCE

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews (Table 6.1).

Table 6.1 Palaeontological Significance of Geological Units on Site

Geological Unit	Rock Type and Age	Fossil Heritage	Vertebrate Biozone	Palaeontological Sensitivity
Knersvlakte Subgroup	Mudstones, siltstones, shales and sandstones of Namibian age	Trace Fossils Assemblages	None	Moderate Sensitivity
Nardouw Subgroup	Light grey sandstones of Silurian Age	marine / estuarine /fluvial trace fossil assemblages	None	Low Sensitivity

7. PALAEOLOGICAL IMPACT AND MITIGATION

The following colour coding method is used to classify a development area's palaeontological impact as illustrated in Figure 7.1:



Figure 7.1 Palaeontological sensitivity map

- Red colouration indicates a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops on the site/route and the chances of finding fossils during the construction phase are very high.
- Orange colouration indicates a possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site/route. Fossils will probably be present on the site/route and the chances of finding fossils during the excavation phase are high.
- Green colouration indicates that there is no possibility of finding fossils in that section of the site/route development.

The desktop survey indicates that most of the areas earmarked for the construction of the log cabins, pedestrian bridges and hydraulic structures are underlain by the Knersvlakte Subgroup, which has a moderate palaeontological sensitivity. Three of the log cabins and 2 pedestrian bridges are located on the Nardouw Subgroup which has a low palaeontological sensitivity.

Although the areas indicated in orange have a moderate palaeontological sensitivity, the development footprint of each of the individual structures is very small and that, where required, any excavations will be very shallow and it is not foreseen that the excavations will penetrate deep into the underlying bedrock.

8. CONCLUSION

The entire Oorlogskloof Nature Reserve is underlain by rocks of the Skurweberg Formation of the Nardouw Subgroup and rocks of the Besonderheid -, Kalk Gat – and Dolkraals Formations of the Knersvlakte Subgroup. The Nardouw Subgroup is known to contain trace fossil assemblages which is sparsely distributed throughout the Subgroup. The Knersvlakte Subgroup on the other hand is known to contain abundant trace fossils throughout the entire Subgroup. Most of the developments are located on the Knersvlakte Subgroup rocks.

Although the Knersvlakte Subgroup is rich in trace fossils the individual developments of the log cabins, pedestrian bridges and hydraulic structures will have a very small footprint area. This small footprint together with the very shallow excavations will not pose a great disturbance to the fossil heritage of the area.

It is thus recommended that the development can proceed without further palaeontological investigation needed. However, the contractor responsible for the construction of the log cabins, pedestrian bridges and hydraulic structures must be made aware of the fact that trace fossils such as burrows can be expected to occur within the development sites, especially if excavations will penetrate the underlying bedrock. In the event that some of these trace fossils are found during excavations, a qualified palaeontologist must be appointed to assess the significance of the find and to apply for the necessary permits from SHARA for the rescue and/or destruction of these fossils.

9. REFERENCES

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10. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the Nelson Mandela Metropolitan University (1996) and the National Diploma in Nature Conservation from the University of South Africa (1990). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

Declaration of Independence

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

A handwritten signature in black ink, reading "Gideon Groenewald". The signature is written in a cursive style and is positioned above a horizontal line.

Dr Gideon Groenewald
Geologist