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N11 X13 PROJECT

PALAEONTOLOGICAL ASSESSMENT OF THE N1 SEBETIELA TOLL PLAZA OFFRAMP AREA, MOKOPANE. IMPACTS BY PROPOSED CONSTRUCTION OF N1 / N11 INTERCHANGE AND ASSOCIATED BORROWPIT

PROVISIONAL DESKTOP STUDY AND PROTOCOL FOR PALAEONTOLOGICAL FINDS

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EXECUTIVE SUMMARY

This provisional desktop study was carried out to assess the potential palaeontological impact of proposed highway construction, interchange, offramp and associated excavation of a borrow pit in the vicinity of the N1 Sebetiela toll plaza / R101 Mokopane offramp. The regional 1:250 000 geological map shows the rocks to the south of the R101 to be dolomite of the Malmani Formation, and chert, forming the Black Reef Formation, both being part of the Transvaal Supergroup. The remaining part of the area to the north and west of the R101 are underlain by conglomerates and minor shales of the Uitkyk Formation, Pietersburg Supergroup, forming the upper part of the Pietersburg Greenstone Belt. This report indicates the existence of fossils in this area to be extremely unlikely, other than stromatolites (primitive algal mats) in the Malmani Formation.

PROVISIONAL DESKTOP STUDY

The 1:250 000 geological map 2428 (Nylstroom) was consulted to establish the regional and local geology. The map indicates the three adjacent areas under discussion are underlain by dolomitic limestone and chert of the Transvaal Supergroup, conglomerates of the Pietersburg Supergroup, separated by a major north-east south-west trending tectonic feature, the Ysterberg Fault, along which the R101 road has been constructed in this area.

Area 1
Sebetiela toll plaza

Area 2
Proposed interchange

Area 3
Proposed borrow pit

GEOLOGY

Pietersburg Supergroup

The Early Archaean rocks of the Pietersburg Greenstone Belt consist of metamorphosed mafic basalts, overlain by conglomerates and shales, with granitoid intrusions. However in the study area only the conglomerate and shales are present, represented by the Uitkyk Formation.

Uitkyk Formation
The lithology consists of coarse detrital sediments with shale and is interpreted as formed in an alluvial fan or braided river. Zircons from granitoid clasts and from

granitoid intrusions have yielded approximate ages of 2 96 Ma and 2.97 Ma respectively, thus reasonably constraining the age of the unit. The Uitkyk Formation has been variously equated with the Moodies Group of the Barberton Greenstone Belt and the auriferous conglomerates of the Witwatersrand Basin. They were briefly mined for detrital gold in the early 1970s.

Transvaal Supergroup
The Late Archaean to Early Proterozoic Transvaal Basin consists of a basal sandstone, chemically precipitated dolomitic limestone, banded iron formations and fluvial siltstones. In the study area only the basal sandstone unit and dolomites occur.

Black Reef Formation
These rocks consist of quartzites, conglomerates and subordinate mudrocks and are interpreted as an initial fluvial palaeoenvironment followed by shallow sea.

Malmani Subgroup
This unit is a 2 000m thick succession of mainly dolomitic limestone with locally developed quartzites. The succession is divided into five formations mainly on the basis of chert content and stromatolite content. The palaeoenvironment is interpreted as being a carbonate platform and represents many erosional surfaces representing marine regressions.

Due to the reaction of slightly acidic water with limestone, sinkholes have developed, and these have filled with breccia mainly during Quaternary times, forming typical “cave breccia” which is common in parts of the Malmani Subgroup.

PALAEONTOLOGY

Pietersburg Supergroup

Uitkyk Formation

The conglomerates are unfossiliferous, but do contain “fly speck carbon”, also found in the Moodies Group of the Barberton Greenstone Belt and in Witwatersrand conglomerates. They likely represent the evidence of unspecified micro-organisms which flourished at that time.

Transvaal Supergroup

Chuniespoort Group

Malmani Subgroup

The palaeoenvironment of the Malmani Subgroup is interpreted as a shallow marine carbonate platform, comprising supratidal stromatolitic mats, intertidal columnar stromatolites and a subtidal zone dominated by extensive stromatolite domes.

Stromatolites are stratified accretionary deposits, formed in shallow water often by the entrapment of fine sediments by primitive photosynthetic micro-organisms such as cyanobacteria. Stromatolites are very common in shallow carbonate deposits of the Archaean and Proterozoic but uncommon today.

Cave Breccia
The sinkholes developed in the dolomites have accumulated debris during the Quaternary and cave breccia is very common in the Chuniespoort region. The breccia is not considered fossiliferous, although conceivably derived fossils from overlying strata could be present. None, however, have been reported.

South African Palaeontology Legislation

SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. A HIA is required under Section 38 (Heritage Resources Management) to assess any potential impact to the palaeontology of the area by a proposed development. The term *palaeontological* in this context is defined by the NHRA as "…any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rocks intended for industrial use and any site which contains such fossilised remains or traces" (NHRA, 1999, p.10). The following clauses detailed below are relevant to palaeontological aspects for a terrain suitability assessment.

Subsection 35 (4)

- No person may, without a permit issued by the responsible heritage resource authority:
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological of palaeontological site or meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assists with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.

Subsection 35 (5)

- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may:

- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Recommendations and Conclusion

Bearing in mind the age and nature of the strata affected by the proposed development it is considered highly unlikely that any fossils will be encountered, save stromatolites. In mitigation it is recommended that a SACNASP accredited palaeontologist from a local institution such as the University of Limpopo makes one visit to the site during the excavation process to examine new outcrops.

References

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