

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG



DESKTOP PALAEOONTOLOGICAL IMPACT ASSESSMENT

Middelbult/Shondoni Colliery

Specialist report by:

Bruce Rubidge

Address: PO Box 85346
Emmarentia
Tel: 072 575 7752
Email: bruce.rubidge@wits.ac.za

Subcontracted by environmental consultants:

Rene Wolmarans

Address: JMA Consulting (Pty) Ltd
P O Box 883
DELMAS
2210
Tel: 013 665 1788 / 4546 / 4544
E-Mail: rene@jmaconsult.co.za

Client / Site:

Sasol Mining (Pty) Ltd

Address: Sasol Mining (Pty) Ltd - Shondoni Colliery
Private Bag X1015
SECUNDA
2302

DATE: 1 December 2020

EXECUTIVE SUMMARY

Bruce Rubidge was appointed by JMA Consulting (Pty) Ltd, on behalf of Sasol Mining (Pty) Ltd, to undertake a desktop Palaeontological Impact Assessment for the Middelbult/Shondoni Colliery within the Govan Mbeki Local Municipality which is located within the Gert Sibande District Municipality of the Mpumalanga Province of South Africa.

The area is underlain by Permian rocks of the Vryheid Formation of the Ecca Group and Jurassic Karoo dolerites. The latter are plutonic igneous rocks, and the sedimentary rocks of the Vryheid Formation are noted for coal reserves. These rock units are in turn overlain by thick Quaternary alluvial deposits covered by grassveld vegetation.

Rocks of the Vryheid Formation contain rich coal deposits which are derived from the famous Permian *Glossopteris* flora which has Gondwana-wide distribution. As large parts of the proposed development will be on rocks of the Vryheid Formation this has the potential to affect fossil plants.

The process of coal mining has the potential to destroy palaeontological heritage, and by its nature coal mining will destroy plant fossils. However, as these fossils are not currently exposed, the expansion of an existing coal mine will enhance possibilities to discover plant fossils. The Quaternary alluvial deposits could potentially hold fossils but as they are not consolidated this is unlikely.

If fossils are exposed in the course expanding the mining development at the Shondoni Colliery a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented (See Appendix A – CFP).

TABLE OF CONTENTS

| | |
|--------------------------------|----|
| 1. Introduction and Brief | 4 |
| 2. Legislative Framework | 4 |
| 3. Details of the Study Area | 6 |
| 4. Geological Setting | 7 |
| 5. Palaeontological Heritage | 7 |
| 6. Methodology | 7 |
| 7. Recommendations | 8 |
| 8. Conclusion | 8 |
| 9. Bibliography | 8 |
| 10. Chance Find Protocol (CFP) | 10 |

1. Introduction and Brief

A desktop Palaeontological Impact Assessment was requested by JMA Consulting (Pty) Ltd on behalf of Sasol Mining (Pty) Ltd for the Middelbult/Shondoni Colliery project within the Govan Mbeki Local Municipality which is located within the Gert Sibande District Municipality of the Mpumalanga Province of South Africa. This report is in support of the S&EIR Process which will determine the effect on palaeontological heritage by development activities. These activities include expansion of the existing Shondoni Colliery to a new Block 8 North Reserve Area (see Figure 1) as well as four new additional ventilation shafts. To ensure sufficient ventilation for the underground mine workings, these shafts are required in the north, north-western region of the Shondoni Colliery EMP boundary area (see Figure 1).

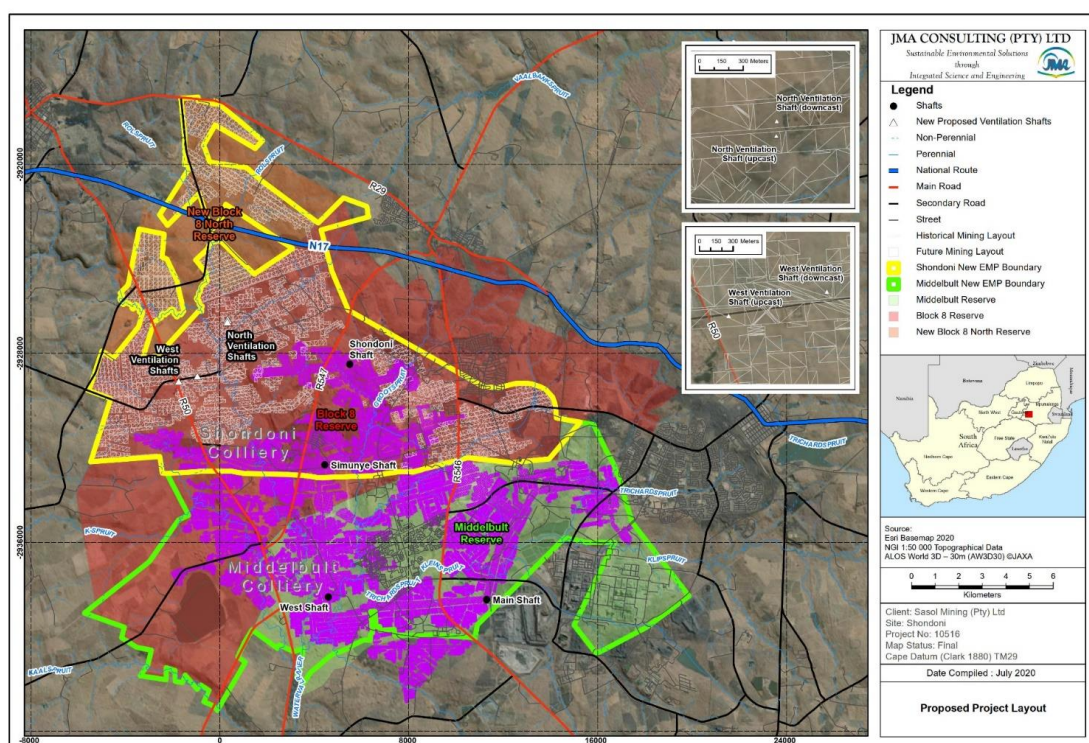


Figure 1: Proposed project layout of the Shondoni Colliery.

2. Legislative Framework

The Department of Environment, Forestry and Fisheries (DEFF) through the National Environmental Management Act (NEMA Act 107 of 1998) requires that developers apply to the competent authority for Environmental Authorization of the proposed development.

National Heritage is protected by the South African Heritage Resources Act (Act No 25) of 1999. Developers are required to submit development plans to SAHRA for

approval. These plans must include documentation detailing the expected impact that the development will have on national heritage.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act include:

- Geological sites of scientific or cultural significance.
- Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, material, meteorites and rare geological specimens.
- Objects with the potential to contribute to understanding South Africa's natural or cultural heritage.

Accordingly, a Heritage Impact Assessment (HIA) is required to assess the possible impacts of a proposed development on archaeological and palaeontological heritage. This report addresses the palaeontological aspects of the HIA as part of the Environmental Management Plan (EMP).

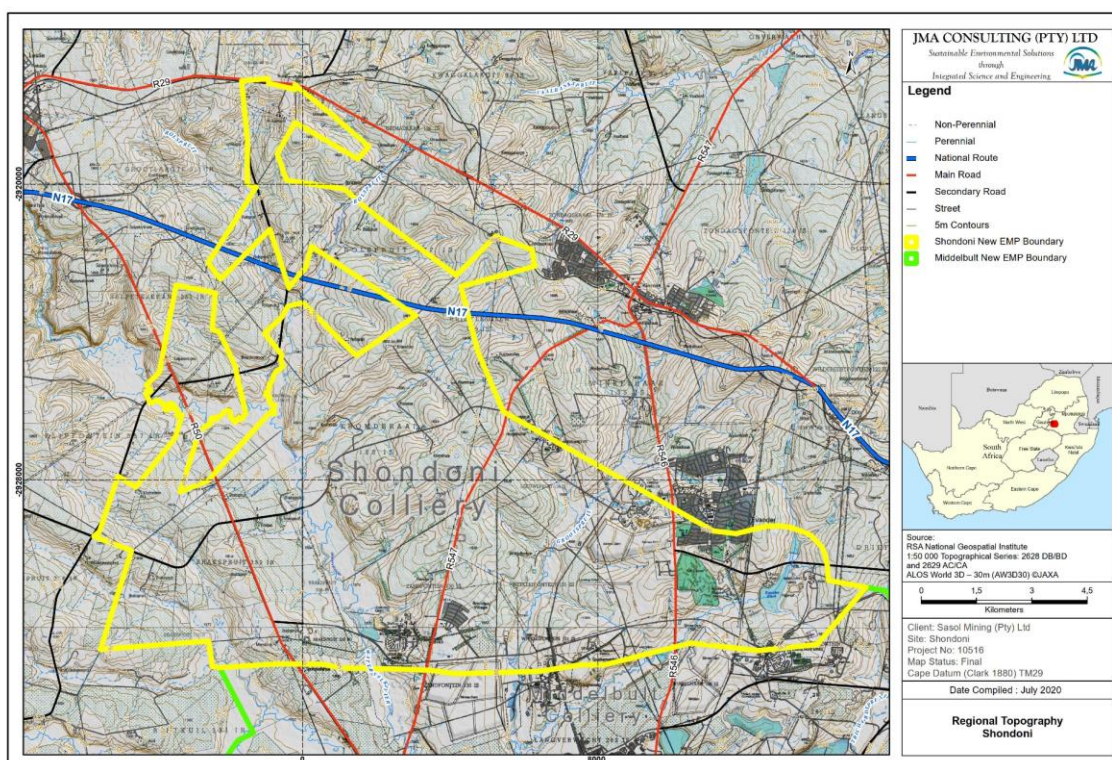


Figure 2: 1:50 000 Topographic Map (2628 BD/DB & 2629 AC/CA) showing the position of the Shondoni Colliery, outlined in yellow.

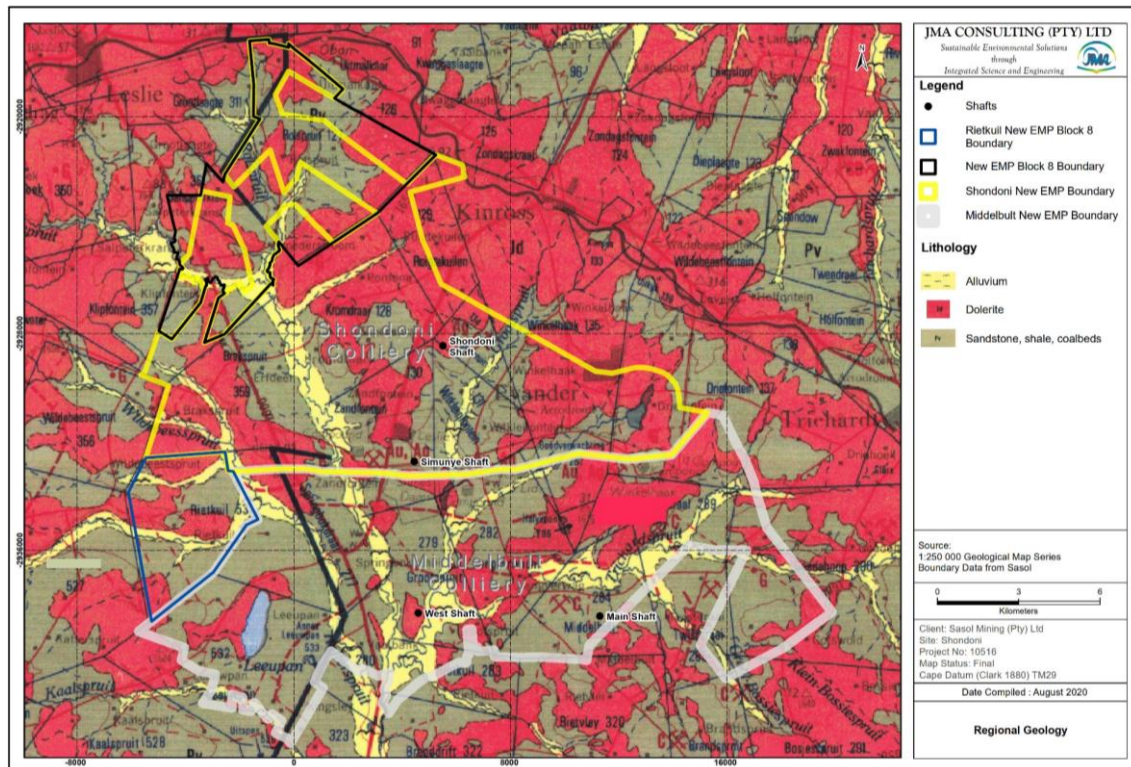


Figure 3: Geological Map (Sheet 2628 East Rand, 1986) showing the position of the study area (outlined in yellow) in relation to the regional geology. PV – Vryheid Formation, Jd – Dolerite

3. Details of the Study Area

Middelbult/Shondoni Colliery falls within the Govan Mbeki Local Municipality which is located within the Gert Sibande District Municipality of the Mpumalanga Province of South Africa (Figure 2). The extent of the study area is delineated by, and includes, the Middelbult Reserve, Block 8 North Reserve, Springbokdraai Reserve as well as the Leeuwan Reserve. The extents of the individual reserves are delineated by the green lines, whilst the position of the Shaft Complex is located on Figure 3.

The site is situated either side of the N17 highway close to Kinross. The extent of the study area is covered by the 1:50 000 topographical map sheets 2628 BD/DB & 2629 AC/CA 2527CA (Figure 1).

JMA Consulting (Pty) Ltd was appointed by Sasol Mining (Pty) Ltd to undertake a S&EIR Process to authorise the expansion of the existing Shondoni Colliery to a new Block 8 North Reserve Area (see Figure 1) as well as the addition of four new ventilation shafts. This report is a palaeontological impact assessment of the study area.

4. Geological Setting

The entire area is underlain by rocks of the Karoo Supergroup comprising sedimentary rocks of the Permian Vryheid Formation and Jurassic Karoo dolerites. The mudrocks, coals and sandstones of the Vryheid Formation were deposited in a delta plain depositional environment. In places Quaternary alluvial deposits are present along the banks of water courses as depicted on Figure 3.



Figure 4: Photographs of the study area showing extensive grassland covering and the thick alluvial overburden.

5. Palaeontological Heritage

The rocks of the Vryheid Formation of the Ecca Group are renowned for their wealth of plant fossils of the famous Gondwanan *Glossopteris* flora which has been described from Permian-aged rocks. This flora is the source of the coal which is mined from the Vryheid Formation in South Africa and is the reason for the coal mining operations. Within the Vryheid Formation there are occurrences of well-preserved elements *Glossopteris* flora comprising wood and/or leaves. Large collections of fossil flora from this Formation are present in the collections of the Council for Geoscience in Pretoria and the BPI Palaeontology at the University of the Witwatersrand in Johannesburg.

6. Methodology

As the area to be developed is covered by grassland and no rocks are exposed (Figure 4), a desktop Palaeontological Impact Assessment was undertaken to identify possible

sensitive fossil occurrences, assess the significance of possible fossil occurrences, comment on the impact of the proposed development, and to make mitigating recommendations. A Chance Find Protocol (CFP) is presented in Appendix A.

7. Recommendations

Because important plant fossil localities are known from the Vryheid Formation the proposed mining development activities may expose rocks of the Vryheid Formation which are not currently visible as they are covered by soil and vegetation.

If mining construction activities expose extensive outcrops of the Vryheid Formation, it will create a unique opportunity to explore the area for fossils. It is thus recommended that, should fossils be exposed, a qualified palaeontologist be contacted to assess the exposure for fossils before further development takes place so that the necessary rescue operations are implemented. Depending on the nature of the fossils discovered this could entail excavation and removal to a registered palaeontological museum collection. A list of professional palaeontologists is available from South African Heritage Resources Agency (SAHRA).

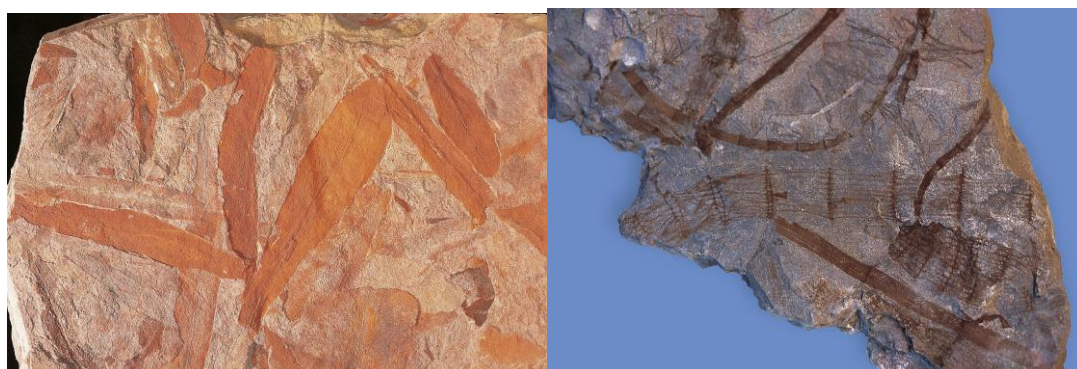


Figure 5: Photographs of floral elements of the *Glossopteris* flora of Gondwana to indicate what fossil plants will look like in the field.

8. Conclusion

The proposed development of Shondoni Colliery will cover Permian-aged sedimentary rocks of the Vryheid Formation and Jurassic dolerites of the Karoo Supergroup. There is a good possibility that the rocks of the Vryheid Formation could contain fossil plant material of *Glossopteris* flora (Figure 5). The process of coal mining has the potential to destroy palaeontological heritage, and by its nature coal mining will destroy plant fossils. However, as these fossils are not usually well preserved and are not currently exposed, the expansion of the Shondoni Colliery will enhance possibilities to discover plant fossils. If fossils are exposed in the mining development at Shondoni Colliery a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented (see Appendix A).

9. Bibliography

Catuneanu O., Wopfner H., Eriksson P.G., Cairncross B & Rubidge B.S., Smith, R.M.H., and Hancox P.J. 2005. The Karoo basins of south-central Africa. *Journal of African Earth Sciences*, 43, 211-253.

Hancox, P.J & Gotz, A.E. 2014. South Africa's colafields – A 2014 perspective. *International Journal of Coal Geology* 132, 170–254

Johnson M.R., van Vuuren C.J., Visser J.N.J., Cole, D.I., Wickens H.deV., Christie A.M., Roberts D.L. & Brandl G. 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson MR, Anhaeusser and Thomas RJ (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria. 361-500.

Mac Rae C. 1999. *Life etched in stone: fossils of South Africa*. The Geological Society of South Africa, Johannesburg, pp 305.

McCarthy, T.S. & Rubidge, B.S. 2005. *The story of Earth and Life – a southern African perspective on the 4.6 billion year journey*. Struik Publishers, Cape Town. pp 333.

Partridge TC, Botha GA, & Haddon IG. 2006. Cenozoic deposits of the interior. In: Johnson MR, Anhaeusser and Thomas RJ (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria. pp. 585-604.

SAHRA. 2013. Minimum standards: palaeontological component of heritage impact assessment reports. South African Heritage Resources Agency, Cape Town. pp15.



Bruce Rubidge PhD, FGSSA, FRSSA, Pr Sci Nat

1 December 2020

APPENDIX A – CHANCE FIND PROTOCOL (CFP)

It is noted that following the findings of this desktop Palaeontological Impact Assessment it is unlikely that fossils will be recovered as a result of expansion developments at Snondoni Colliery. The following procedure is required if fossils are exposed by excavations.

1. If fossils are exposed by excavation in the rocks of the Vryheid Formation of the Eccra Group and also unconsolidated Quaternary deposits they must be inspected by the environmental officer or designated person.
2. If fossils are noted in the unconsolidated Quaternary sands (includes bones, insects or plants) a suitably qualified palaeontologist must be approached for a verdict.
3. Fossil material displaced by excavation should be placed in a protected area, in this way development activities will not be held up.
4. Appropriate photographs of the fossils which have been noted should be sent to a qualified palaeontologist for a verdict on how to proceed. This may require a site inspection and excavation by the palaeontologist.
5. Fossils that are deemed to be of good quality or of scientific importance by the palaeontologist must be removed and curated in a recognised palaeontological museum collection where they can be made available for further study.
6. Before fossils are removed from the site a collecting permit must be obtained from SAHRA, and the required permitting procedures and requirements must be followed.
7. If the fossil material is deemed by the registered palaeontologist (as a result of photographic evidence or a site visit) to not be worthy of excavation and curation in a museum collection, the material will not be removed.
8. Mitigation will involve an attempt to capture all rare fossils and systematic collection of all fossils discovered by a registered palaeontologist. This will require routine collecting protocols involving descriptive, diagrammatic and photographic recording of fossils and exposures. The fossils and appropriate contextual samples will be processed to create an archive collection.
9. Should a major *in situ* occurrence be exposed, excavation will immediately cease in that area so that the discovery is not disturbed or altered in any way until the appointed palaeontologist has investigated the find.
10. Should no fossils be discovered in the process of development and excavations have been completed, no further monitoring will be required.
11. Any site visits by a registered palaeontologist and/or excavation of fossil material required, will be undertaken at the cost of the developer.